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ABSTRACT

Three House of Representatives' subcommittee hearings were held in March, May, and July 1996 to evaluate the goals, priority setting, and advisory mechanisms of federal programs in agricultural research, education, and extension. To become competitive in global markets, farmers will need to rely on the research community to provide up-to-date technology and market information. The purpose of the hearings was to establish research priorities for the 21st century, improve the efficiency and effectiveness of the federal research investment, and improve accountability through the establishment of a coordinated advisory and priority setting mechanism. Testimony was received from U.S. Senators and Representatives; Under-Secretaries from the U.S. Department of Agriculture (USDA); and spokespersons for agribusiness associations, agricultural science associations, research institutions, land grant universities, and the Extension Service. The following topics were discussed: the role of the National Center for Agricultural Utilization and Research (Peoria, Illinois) in commercialization of agricultural products; financial and political threats to the federal government's role in agricultural research and education; research priorities related to human nutrition, new agricultural and livestock pests and diseases, food safety, and farming's environmental issues; replacing petrochemical ingredients in industrial products with agriculture-based ingredients; proposed participants and processes in setting research priorities for government funding; importance of sustainable agriculture; the needs of rural families and communities that are not usually well supported in USDA budgets and extension programs; worldwide research on consumer food preferences; structure and funding of federally funded agricultural research programs conducted by land grant universities, the USDA Agricultural Research Service, and the agribusiness industry; and the role and methods of the Cooperative Extension Service in disseminating research-based information to farmers. (SV)

RC

THE EVALUATION OF FEDERAL PROGRAMS IN AGRICULTURAL RESEARCH, EDUCATION, AND EXTENSION

ED 401 063

HEARINGS

BEFORE THE

SUBCOMMITTEE ON RESOURCE CONSERVATION,
RESEARCH, AND FORESTRY

OF THE

COMMITTEE ON AGRICULTURE
HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTH CONGRESS

SECOND SESSION

MARCH 27, MAY 14, JULY 17, 1996

Serial No. 104–27

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CONTENTS

Page

MARCH 27, 1996

Allard, Hon. Wayne, a Representative in Congress from the State of Colorado, opening statement 1
Barret, Hon. Bill, a Representative in Congress from the State of Nebraska, opening statement 3
Chenoweth, Hon. Helen, a Representative in Congress from the State of Idaho, prepared statement 7
Clayton, Hon. Eva M., a Representative in Congress from the State of North Carolina, prepared statement 6
Johnson, Hon. Tim, a Representative in Congress from the State of South Dakota, prepared statement 5
LaHood, Hon. Ray, a Representative in Congress from the State of Illinois, prepared statement 4
Pomeroy, Hon. Earl, a Representative in Congress from the State of North Dakota, prepared statement 6
Stenholm, Hon. Charles W., a Representative in Congress from the State of Texas, prepared statement 5

WITNESSES

Abernathy, John, past president, Weed Science Society of America 47
    Prepared statement 122
Anderson, Joe, first vice president, U.S. Canola Association 49
    Prepared statement 129
Apple, Martin, executive director, Council of Scientific Society Presidents 30
    Prepared statement 73
Baumgardt, Bill, representing the Federation of American Societies of Food Animal Science 32
    Prepared statement 80
Herrett, Richard, executive director, Agricultural Research Institute 35
    Prepared statement 95
Marler, Ron, president, Association of American Veterinary Medical Colleges . 42
    Prepared statement 109
Merrigan, Kathleen, Wallace Institute for Alternative Agriculture 34
    Prepared statement 84
Stauber, Karl, Under Secretary for Research, Education, and Economics, Department of Agriculture 7
    Prepared statement 60
Stowe, Barbara S., past chair, NASULGC, Board on Human Services 44
    Prepared statement 118
Zeikus, Gregory, Michigan Biotechnology Institute 26
    Prepared statement 105

SUBMITTED MATERIAL

Godown, Richard D., Biotechnology Industry, statement 133
Suiter, Daniel R., Purdue University, statement 144

MAY 14, 1996

Allard, Hon. Wayne, a Representative in Congress from the State of Colorado, opening statement 145

Page
Crapo, Hon. Michael D., a Representative in Congress from the State of Idaho, opening statement 146
Johnson, Hon. Tim, a Representative in Congress from the State of South Dakota, prepared statement 148

WITNESSES

Barry, Peter, president, Consortium of Social Science Association 195
  Prepared statement 259
Coffey, Joseph D., chairman, Council for Agricultural Research, Extension, and Teaching 183
  Prepared statement 227
Helgesen, Robert G., National Association of State Universities and Land Grant Colleges 177
  Prepared statement 213
Lechtenberg, Victor L., president, Council for Agricultural Science and Technology 175
  Prepared statement 209
Nelson, C. Jerry, on behalf of American Society of Agronomy; Crop Science Society of America; and Soil Science Society of America 189
  Prepared statement 237
Owens, Elizabeth, on behalf of National Research Council, Board of Agriculture, National Academy of Sciences 179
  Prepared statement 221
Rasmussen, H. Paul, chairman, Experiment Station Committee on Organization and Policy 181
  Prepared statement 216
Rissler, Jane, Union of Concerned Scientists 191
  Prepared statement 245
Swanson, Barry G., Institute of Food Technologists 187
  Prepared statement 223
Thompson, William F., on behalf of American Society of Plant Physiologists 193
  Prepared statement 254
Woteki, Catherine, Deputy Under Secretary for Research, Education, and Economics, Department of Agriculture 148
  Prepared statement 200
Zimbelman, Robert G., chairman, Coalition on Funding Agricultural Research Missions 173
  Prepared statement 206

SUBMITTED MATERIAL

Smith, C. Michael, Kansas State University, submitted statement 264

JULY 17, 1996

Allard, Hon. Wayne, a Representative in Congress from the State of Colorado, opening statement 271
Crapo, Hon. Michael D., a Representative in Congress from the State of Idaho, opening statement 273
Johnson, Hon. Tim, a Representative in Congress from the State of South Dakota, opening statement 273
Pomeroy, Hon. Earl, a Representative in Congress from the State of North Dakota, prepared statement 280

WITNESSES

Avery, Dennis, director, global issues, Hudson Institute 288
  Prepared statement 323
Donald, Sam, regional director, 1890 Programs 293
Guthrie, Tom, Sustainable Agriculture Coalition 285
  Prepared statement 318
Luft, Leroy, chairman, Committee on Organization and Policy 284
  Prepared statement 312
Robinson, Bob, administrator, Cooperative State Research, Education and Extension Service, U.S. Department of Agriculture 276
  Prepared statement 307

Page

Rose, Kenneth, vice president, research and education, National Grain Sorghum Producers 292

Prepared statement 339

Urmston, Dean, executive vice president, American Seed Trade Association 295

Prepared statement 347

Weber, Gary, Animal Agriculture Coalition 290

Prepared statement 336

Woteki, Catherine, Acting Under Secretary, Research, Education, and Extension, U.S. Department of Agriculture 274

Prepared statement 305

SUBMITTED MATERIAL

Anderson, Sharon, director, North Dakota State University Extension Service, submitted statement 357

Armbruster, Art, Council on Food, Agricultural and Resource Economics, submitted statement 360

THE EVALUATION OF FEDERAL PROGRAMS IN AGRICULTURAL RESEARCH, EDUCATION, AND EXTENSION PROGRAMS

WEDNESDAY, MARCH 27, 1996

House of Representatives,
Subcommittee on Resource Conservation,
Research, and Forestry,
Committee on Agriculture,
Washington, DC.

The subcommittee met, pursuant to call, at 9:12 a.m., in room 1300, Longworth House Office building, Hon. Wayne Allard [chairman of the subcommittee] presiding.

Present: Representatives Gunderson, Barrett, Smith, Lucas, Lewis, Crapo, Chenoweth, LaHood, Johnson, Stenholm, Peterson, Clayton, and Pomeroy.

Staff Present: Doug Benevento, subcommittee director; John Goldberg, professional staff; Curt Mann, staff assistant; Anne Simmons, minority consultant; Wanda Worsham, committee hearing clerk; and Callista Bisek, assistant hearing clerk/scheduler.

OPENING STATEMENT OF HON. WAYNE ALLARD, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF COLORADO

Mr. Allard. The House Subcommittee on Resource Conservation, Research, and Forestry will please come to order.

These are going to be hearings in regard to the evaluation of the goals, priority setting, and advisory mechanisms of Federal programs in agricultural research, education, and extension. As most of you know, House and Senate conferees have recently completed work on the Federal Agricultural Improvement and Reform Act of 1996, now referred to as FAIR.

It is the opinion of this subcommittee that while some progress was made in Federal agricultural research programs, there is still a substantial amount of work to be done. As a result, the conference committee agreed to a 2-year authorization for research, education, and extension programs in order to give the Congressional Agriculture Committees time to complete our review and develop comprehensive reform legislation.

In this regard, I would like to welcome all of you to the first in a series of hearings this subcommittee will hold in order to review Federal programs in agricultural research, education, and extension.

Since the beginning of the 104th Congress, the House Agriculture Committee has been engaged in a comprehensive review of agriculture research programs. This review has consisted of an extensive survey of researchers and research users, a thorough accounting of research programs conducted by the General Accounting Office, and now these hearings.

The United States is the world leader in the production of food and fiber. Our ability to feed and clothe our Nation and much of the world is the direct result of the priority we have placed on agricultural research, education, and extension programs conducted with public and private funding.

There is no doubt that researchers and educators within the United States Department of Agriculture and our Land Grant universities have responded well to the needs of production agriculture in the past. Under freedom to farm, farmers will for the first time in over 60 years be given the opportunity to compete in a global market. This dramatic change in the Federal agriculture policy creates new challenges and opportunities for the research sector.

To become competitive, farmers will need to rely on the research community to provide up-to-date technology and market information. In the past, when money seemed unlimited, we simply added new programs to the old and continued on. While I doubt it would bother anyone in this room if we simply increased Federal investments in research and development, this simply is not an option.

To respond to the new and evolving needs of production agriculture, Federal research programs will also have to evolve to meet the needs of the investors. This means promoting greater linkages, coordination, efficiency, and accountability.

This new role for agriculture research requires that we all evaluate the policies that govern research, education, and extension. Our challenge in crafting legislation will be to determine ways to improve the efficiency and effectiveness of the Federal research investment.

The purpose of these hearings is to give us the opportunity to focus our attention on establishing research policies for the 21st century, the ultimate goal being to insure that the money is spent wisely. Probably the most important objective in reaching this goal is to improve accountability through the establishment of a coordinated advisory and priority setting mechanism.

During this hearing, the subcommittee would like to discuss current research goals, priority setting mechanisms, and advisory mechanisms. In this context, we would like the witnesses to confine their remarks to discussing how best the research community, as well as producers, processors, retailers, and consumers, can work together with the department to insure that priorities are addressed.

With this goal in mind, we would like to review models and concepts that might be used by the department's Research Advisory Board. For instance, I am aware of a priority setting model known as FAIR '95, Food, Animal Integrated Research for 1995, which we will hear about today from a couple of our witnesses. This model was developed by the animal science and veterinary science community in order to insure stakeholder involvement in developing an action agenda for publicly and privately funded research. While the

5

results of the FAIR '95 process may not apply to all interest groups, I believe that the model has merit and should be pursued.

Today with the help of our witnesses, it is our job to review and develop a model or models for priority setting mechanisms that can be applied to all of our research, education, and extension programs.

Again, I welcome all of our panelists and guests and now yield to the distinguished Ranking Minority Member, who is not here yet, and since he is not here, I will ask for any comments on the Majority side, and then when Mr. Johnson is here, we will give him an opportunity to insert his comments in the record.

So do we have any members from the Majority side who would like to make a brief statement? The gentleman from Nebraska.

OPENING STATEMENT OF HON. BILL BARRETT, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEBRASKA

Mr. BARRETT. Thanks, Mr. Chairman. I will make a very brief statement in order to help bail you out with the time.

[Laughter.]

Mr. BARRETT. I appreciate very much your calling this hearing today. I think it is particularly timely, especially on the heels of a brand new farm bill. It seems to me that the primary intent perhaps of this hearing is to remind all of us that the new farm bill is not an expansion of authority. I think that is very critical for everyone, not only the Under Secretary and his department, but Members of Congress as well.

As you suggest, Mr. Chairman, it is a 2-year reauthorization with limited new authority. I think the Advisory Board to improve the research coordination is the only new authority that we have in the new farm bill.

So I hope the hearing will focus on the goals of agriculture research, as you suggested, Mr. Chairman, and also some priority setting. I think it is very important at this time. It will give us some advanced time to plan for that time two years hence when we do make some major changes, if that is, in fact, the case.

So thanks again, Mr. Chairman. I look forward to the testimony from our witnesses.

Mr. ALLARD. I thank the gentleman for his remarks.

And for the benefit of those of you in this room who have not been at previous hearings, usually we do limit our remarks at the beginning of the hearing, but if there are any other comments from Members of this committee, we would welcome those at this time.

Mr. LaHood.

Mr. LAHOOD. Mr. Chairman, I have a statement that I would like to enter into the record and also welcome Dr. Stauber and acknowledge the fact that I have the National Center for Agricultural Utilization and Research, more commonly known in my district as the Peoria Agriculture. Lab, and we are grateful for that wonderful facility and the work that goes on there and look forward to having an opportunity to have a dialogue with Dr. Stauber and others regarding what we are doing there and other information they may have for us.

So thank you for holding this hearing, and I hope my statement can be made a part of the record.

[The prepared statements of Messrs. LaHood, Stenholm, Johnson, Pomeroy, Mrs. Clayton and Mrs. Chenoweth follow:]

STATEMENT OF HON. RAY LAHOOD

Mr. Chairman. Thank you for holding these hearings on a very important subject. Research is vital to American agriculture if it is to remain competitive and ready to meet the challenges that lie ahead in the 21st Century. Additionally, I welcome Dr. Stauber, the Under Secretary for Research at USDA, and thank him for making himself available to us today.

Mr. Chairman, I welcome the opportunity to proceed with a full review of research and extension programs by the Subcommittee. As a Member of this Subcommittee, I am keenly aware that research will play an even larger role than it does today. Additionally, as one might expect, I am interested in forwarding the progress and development of the Peoria lab, not only for the city, but for corn and soybean producers around the Nation.

Founded by Congressional Act in 1938, the lab was created to provide American agriculture with continued new uses for American-grown crops. That effort has been tremendously successful and, far and away, a wise investment of precious taxpayer funds.

The Peoria lab is a shining example of what government can do to provide a growing world with a safe and ample supply of food, at a reasonable cost to the taxpayer. The Peoria lab, called the National Center for Agricultural Utilization and Research (NACAUR), is a major ARS research facility. Work at NACAUR focuses on commercialization of products and uses for agricultural commodities and encompasses three areas: finding new market opportunities for commodities, securing environmental quality and compatibility, and ensuring food safety. Additionally, since American agriculture will get less of its income from the Federal government, and more from the marketplace, we must now, more than ever, provide agriculture with the tools to get more of its income from the marketplace and not from Washington.

One tool in the arsenal of technology is the Peoria lab. The lab is the flagship facility for corn and soybean research in the world. It has attracted national and international attention for its research conclusions. For instance, Mr. Chairman, essential discoveries made at the Peoria facility enabled mass production of the life-saving drug penicillin. This all happened in a relatively short period of time from its original beginning in 1938.

But, as global technology competition increases, the continued development of new innovative scientific knowledge becomes increasingly important. The enabling technical information provides the foundation for continued joint technology development work leading to increased demand for the farmer's crop and new jobs in the manufacturing economy. A balance of fundamental and applied research will be vital for continued success in the future. A vibrant public research center, like the Peoria lab, is ideally suited to conducting interdisciplinary scientific research directed to solving technical problems through the discovery of new knowledge.

Additionally, in 1986, my predecessor, Congressman Robert Michel, was instrumental in forwarding the growth of the Peoria lab with passage of the Federal Technology Transfer Act of 1986 (PL 99–502). The Act has had a significant impact on enhancing its ability to commercialize new technology leading to new uses and markets of agriculture commodities. They now routinely partner with the private sector for the final development of new products and processes. For instance, the Peoria applied an already secured patent using oil and adapted it for use on industrial equipment manufactured by Caterpillar, Inc., a Peoria-based company.

Specifically, they developed a variety of environmentally friendly lubricants and functional fluids from renewable vegetable oil which can be used on heavy equipment. Through this partnership, new uses for agricultural material can be developed with built-in market pull, that is Caterpillar went to the lab with their specific needs, thus speeding the movement of technology from the laboratory to the marketplace.

The Peoria lab is doing tremendous work with soybean oil inks, which, in addition to being totally biodegradable, represents a tremendous potential market for American agriculture. The lab's current patented process for newspaper inks alone would increase demand for soy oil by an additional 500 million pounds, not to mention the potential for the use of soy ink in magazines, books and other special printing needs. In each case, this represents more income from the market for farmers; and less from the taxpayer. I support that, and would hope that you would.

These are only two primary examples of the new and exciting things that are happening at the ARS lab in Peoria, Illinois. Congress has acted to reauthorize research monies.

Congress must continue commitment to creative scientists who, in turn, provide market-driven assistance to America's farmers and the American public. Most importantly though, new technology must be proven through the process of scale-up from the laboratory to commercial implementation.

Once again, I thank the Chairman for holding these hearings and allowing me to extoll the benefits of the Peoria lab. I look forward to Secretary Stauber's comments, and I do have a few questions for him, Mr. Chairman. That concludes my statement.

STATEMENT OF HON. CHARLES W. STENHOLM

I have long been interested in a thorough evaluation of our current agricultural research machine. As the Chairman of the subcommittee of jurisdiction during the 103rd Congress, I had hoped to hold hearings on agriculture research.

The important point is that we are having hearings and many questions that could have been asked during the 103rd Congress are still pertinent and still need to be asked.

As you all know we have recently reauthorized the ag research programs in the FAIR 96 Act--which the ink is still drying on--but only for 2 years. The comprehensive ag research evaluation is still needed. Therefore I am happy to see the subcommittee Chairman holding today's hearing.

Essentially, the important question that we must ask ourselves is, "does the agricultural research structure that has evolved really serve the needs of society?" By that question, I do not mean how can we move the boxes around, but is a fundamental reorganization needed?

We have to be asking this question of our government more and more often if we are serious about balancing budgets and learning to live better with less when it comes to our government. And our public investment in research is no different.

I do not believe that discussions should bog down in basic versus applied research missions. I think the more important path to follow is how can we deliver an efficient mix of the two, that is basic and applied research.

A basic research function will always need to be considered by government or the public at large. Some applied research will need public involvement especially in those areas where there is a broad public benefit.

The larger more important question is how should basic and applied agricultural research compliment each other? And how can improvements be made in the overall ag research machine, producing the best research, at the least cost, that prepares this Nation for future agricultural challenges. And adding in one more important challenge to the question: being able to measuring accomplishments derived from the research so that good research continues to receive funding and less than the best research does not.

I look forward to hearing and learning from the witnesses on their opinions on how the current system measures up and how improvements can be accomplished.

Again, I thank the Chairman for starting a hearing record on this issue.

STATEMENT OF HON. TIM JOHNSON

Mr. Chairman, thank you for calling this hearing today. With the action taken in the farm bill conference to extend current research authorities for only two years, we will indeed be taking an in depth look at the agricultural research infrastructure in this country. This follows with the plan you and Chairman Roberts set out last spring to ensure that America's farmers, ranchers and consumers will continue to benefit from the cutting edge research taking place at our federal facilities and land grant institutions.

I was pleased to have joined you in that effort and look forward to the testimony to be received today and in any future hearings that may take place. I am hopeful that as we hold future hearings that we are able to hear from additional agricultural producers and consumers--the supposed beneficiaries of our research initiatives as well as the providers of the tax dollars that pay for our federal and state research activities. In fact, I am sorry that the one farmer that we have appearing at today's hearing is last on the list.

I am hopeful that if we do hold additional hearings, we will examine every aspect of agricultural research, extension and education from the priority setting mechanisms we will be discussing today to the ability of our current infrastructure to disseminate the results of research activities and meet the needs of what is becoming a very diverse ag economy in this country, and whose needs will increase as direct government support ends.

STATEMENT OF HON. EARL POMEROY

Mr Chairman, thank you for holding this hearing on the goals and priority setting for federal programs in agricultural research, education and extension. The farmers and ranchers in my state of North Dakota rely heavily on the information generated by the federal agricultural research system. The research and education efforts of North Dakota State University are of particular importance to them in managing their operations.

The need for continued and increased investment in research and education programs has not been more evident than recently. It seems as if North Dakota has been beset by a virtual plague of wheat disease and insect problems. For the past three years wheat and barley crops have been infected with a disease known as scab. The disease affects grain quality and leaves a chemical in the grain known as vomitoxin. This lowers the grain quality and limits the usefulness of the grain in processing uses.

Losses due to scab in the Great Plains have been estimated to be as high as $1 billion annually.

The barley, durum and wheat varieties grown in the upper Midwest have little resistance to scab disease. Agronomists and plant breeders at NDSU have been working diligently to develop solutions to stop this disease. Even as progress was being made, however, a new disease entered the picture, Karnal Bunt. Over 20 nations prohibit the importation of wheat from countries where Karnal Bunt is known to occur. In addition to causing difficulties for US exports of wheat, Karnal Bunt has also inhibited efforts to develop scab resistant wheat varieties. Since wheat breeders use Arizona as a winter nursery for their variety development programs all of their seed has been quarantined to prevent the spread of Karnal Bunt. This delay is a severe blow to the wheat producers of my state and the entire upper Midwest.

To add insult to injury yet another wheat problem has entered the scene, Orange wheat blossom midge. The midge attacks the wheat flower and reduces yield. It is especially a problem in years with delayed planting due to wet cold springs as has been the case the past two years in North Dakota. In some cases the infestation may be so bad that farmers may not plant a wheat crop at all this year. So when wheat prices are highest North Dakota producers may be left without a crop due to disease and insect pressures.

The good news is that many of these problems can be solved through research and education. The plant breeders at NDSU have begun to develop scab resistant varieties. NDSU agronomists tell me that many of the problems associated with midge can be controlled through Integrated Pest Management practices and field scouting. Clearly though these efforts require a healthy commitment to support research and education programs.

I welcome the opportunity to participate in a serious review of federal agricultural research and education programs. Many of our Universities are undergoing a radical change as large numbers of faculty are currently retiring. Now is the time to assess the research and education needs and opportunities of the future. We must be prepared to make the financial and institutional commitment necessary to ensure the long-term competitiveness and sustainability of American agriculture. If we are determined to throw farmers on the open market with no safety-net we must provide the research to keep them the most competitive in the world.

STATEMENT OF HON. EVA M. CLAYTON

I would like to welcome all of our distinguished witnesses today to discuss an issue integral to the health of not just the rural areas of our country, but all areas. I am especially delighted to welcome Dr. Karl Stauber, the Under Secretary for Research, Education and Economics for the U.S. Department of Agriculture, who is a native North Carolinian.

It is imperative in this time of rapidly changing priorities and funding levels that Congress plan prudently for the future. In light of the recently passed Farm Bill, it is particularly important that the Agriculture Committee shoulder their responsibility of this visionary process. Federally funded research, education and extension programs have been vital to the health and progress of American agriculture. Without these critical programs, agriculture and agribusiness would not have had the strong foundation or the reinforcement necessary to succeed as well as they have to date.

I am eager to see the results of the full review of USDA research and extension policy, so that we may give these major issues the necessary tools to rise to even greater heights. It is not appropriate fiscal policy to be penny wise and dollar foolish. If we do not devote adequate resources to research, education and extension, we cannot expect them to even begin to serve the existing and ever increasing need.

It may be hard to make the connection at times, since our rural populations are consistently declining and agriculture is no longer the largest source of jobs. But we cannot let research,education and extension services suffer since their importance becomes accentuated through the sheer numerical decline. It is essential that those who remain in agriculture and agribusiness have access to the most timely and technically advanced information possible so that the limited resources available are maximized and utilized fully.

I am confident that the testimony that will be shared with the Subcommittee today will be extremely useful as we begin the arduous process of priority-setting.

Again welcome to all the witnesses and thank you, Mr. Chairman, for the opportunity to speak.

STATEMENT OF HON. HELEN CHENOWETH

I would like the thank the Chairman and the ranking member for holding this hearing today on the federal role in agricultural research. I would further like to thank the chairman and the ranking member for the leadership they demonstrate by having our subcommittee undertake this endeavor of a top to bottom review of the federal government's role in agricultural research.

Agricultural research is truly a "win win" enterprise.

Our farmers are faced with uncertainty at almost every turn in agriculture. Environmental concerns, unfair subsidization of foreign competition, insects and new forms of blight all pose threats to our farmers. It is through proper investment in research for example that our farmers are able to find more effective ways to apply fewer chemicals to their crops and still have a greater yield of a healthier crop. It is through proper investment that we are able to develop a higher quality crop that will be in demand in markets that our highly-subsidized competitors will not be able to match. Lastly, it is through research that we can find new disease—and insect—resistant crops that make the use of costly control products and practices irrelevant.

The task we have set for ourselves is to ensure that the funds spent on agricultural research be allocated for the most efficient and effective projects possible. With our priorities for a balanced budget, federal funding is becoming constricted. With agriculture research as a priority for the committee, I feel confident that we will be able to maintain a strong investment in research for agriculture. But, that investment must be made wisely.

These hearings will give us an opportunity to develop policies for federal agriculture to ensure that tax dollars are being spent in the wisest way possible. When establishing these policies I hope that we can build accountability into the system to assure that responsibility is emphasized. America is clearly the leader in food production. It has been through research that we have been able to establish ourselves as the world leader and it will only be through research that we continue to improve our ability to feed the world.

Mr. ALLARD. Very good. We will go ahead and proceed with the hearing now, and I would like to welcome the first panel.

Dr. Karl Stauber who is Under Secretary for Research, Education, and Economics for the USDA, and welcome, Dr. Stauber. I understand that you are accompanied by Dr. Woteki, your Deputy Under Secretary; Dr. Horn; Dr. Robinson; Dr. Offutt, and Dr. Bay, and so I will turn the testimony over to you, Dr. Stauber, and then I assume that we will hear primarily from you, and then any other comments that your Under Secretaries would like to make that would be brief, we would appreciate it, and then we will open it up to questions.

STATEMENT OF KARL STAUBER, UNDER SECRETARY FOR RESEARCH, EDUCATION, AND ECONOMICS, U.S.DEPARTMENT OF AGRICULTURE

Mr. STAUBER. Thank you, Mr. Chairman.

You have introduced the leadership team for the research, education, and economics mission area here at the Department. Dr. Woteki is the Deputy Under Secretary, Dr. Horn is the Administrator of ARS, Don Bay is the Administrator of the National Agricultural Statistic Service, Dr. Offutt, with the Economic Research Service, is the Administrator, and Dr. Robinson, with the Cooperative State Research, Education, and Extension Service.

We represent the Federal partner in the agricultural knowledge system. The goal of this system is to provide the highest quality research and analysis based on the needs of our partners and customers, including the U.S. consumer, so as to assure safe, affordable food; a healthy, well-educated population; profitable, competitive farms and ranches; viable rural communities, and healthy ecosystems.

We have made important progress in the 1996 farm bill. We welcome these hearings on the future direction of research, education, and extension. And we urge passage of a revised research title before the August recess if possible. Several of the critical members of this committee are seeking employment in other chambers. Nobody knows what next year will bring. We are concerned that to have research out of sync with the rest of the farm bill in a time of continuing budget constraints may present a potential exposure to budget challenges.

We believe this is a time to invest more in agricultural research and related fields, not less. We must improve the quality and the relevancy of the work that we do, not weaken it.

I look forward to working with the committee to improve and to protect the agricultural knowledge system.

There are many threats to that system. I want to touch very briefly on three of them, and then make four recommendations for inclusion in a revised research title.

You have already mentioned one, Mr. Chairman, and that is increased budget competition. The President's budget as recently submitted shows a 20 percent decline in the USDA discretionary budget over the next 4 years. At this point 100 percent of the research, education, and extension activity that the U.S. Department of Agriculture conducts or supports is funded out of discretionary sources.

At the same time, many States are facing flat or declining budgets, and many of our partners in the Land Grant community have also already seen important cuts in their core support.

All of this forces us toward increasing reliance on private research, and we believe that there should be a very strong partnership between public research and private research. However, if we do not have a strong public partner, we will have a weaker private partner. As a result, in a world of declining budgets, the question becomes one of how do we protect and focus our agricultural research, education, and extension efforts.

The second threat to the agricultural knowledge systems has to do really with the ignorance of the now suburban majority. The suburbs, as many of us are aware, now hold substantial political power in this country. It was in 1990 that the census reported that the majority of Americans live in communities of larger than 1 million, and the vast majority of that growth since the 1950s has occurred in the suburbs. The first time in the history of this country, where the majority of votes cast for all parties for the presidency were cast from suburban districts, was in 1992. And 1994 is the first time in the history of the country where the five senior leadership positions within the House of Representatives are all occupied by people from suburban districts; none of those five came from an agricultural district.

As a result, the important challenge before us is how we justify our work to the suburban majority.

Finally, the third threat to the agricultural knowledge system, in many ways the primary topic of these hearings, is demand for greater accountability. How do we insure that public resources serve public goals? How do we build linkages between long-term research and changes in our society?

Much of the work we do takes 15 to 20 years to see full fruition in the field. We need to shorten that time period, but the system also needs to be protected from being penalized because of that delay.

The U.S. Department of Agriculture is committed to the Government Performance and Results Act. We believe that is an important part of the answer on accountability. I have asked Dr. Woteki to lead that effort within our mission area, and she is just about ready to release a draft strategic plan for our mission area for a 5-month review and comment period.

We must continue to work with our partners and our customers to insure that, in fact, we are accountable.

Much has been done in the 1996 farm bill, but there is still much left to do. Although my written testimony provides more detail, let me just hit four highlights that we believe will strengthen the research and extension partnership.

First, we are very interested in being in a position to move from earmarked special research grants to a competitive special grants authority.

Second, and in a related manner, we would very much like to move from noncompetitive facility construction into a program of having a national competition for the construction with Federal support of important facilities and large-scale equipment costs.

Third, the Fund for Genetic Security. We believe that we are under-investing in genetic resources, both plant and animal. We believe that we need to mount an aggressive new effort to collect, characterize, store, and use genetic material if we are, in fact, to insure the long-term economic viability of American agriculture.

And, fourth, we believe that it is critical to move the authority for conducting the census of agriculture from the Department of Commerce to the Department of Agriculture.

We are requesting new authority in each of these four areas. We want to work closely with the committee to move forward on these and other ideas that the committee may have, but we implore you to do it quickly so that in years ahead as we struggle with continuing budget concerns, research is not left out there exposed to unreasonable cuts.

Thank you very much, Mr. Chairman. My colleagues and I are ready to respond to the questions that you and members of the committee may have.

[The prepared statement of Mr. Stauber appears at the conclusion of the hearing.]

Mr. ALLARD. Thank you for your comments.

I forgot to mention to you and the first panel and for the benefit of the following panels that we do have a light system up there on the front table, and the green light means you have 5 minutes, and then the caution light comes on when you have about a minute left, and then the red light we'd like to wrap up your testimony.

You did a very nice job of staying within your time limit, and I appreciate that.

Mr. STAUBER. Thank you.

Mr. ALLARD. We did receive your written comments for the record, and in your discussion on the Government Performance and Results Act, you mentioned five priority outcomes for the research, education, and economics mission area.

First of all, I would like to ask you how these priority outcomes were determined.

Mr. STAUBER. They were determined based on consultation with a large array of people and organizations throughout the United States, as a prelude to the administration's development of the blue book proposal on the farm bill. We did not do any formal hearings, but we reviewed, for example, the FAIR '95 materials. We reviewed the recommendations of the Joint Council, and many other groups, and tried to pull from those a set of issues that we thought represented the best thinking within that broad array of input we received.

Mr. ALLARD. I guess my concern in hearing your priority setting process is whether there was adequate user input among all these groups. I think we really have to be sensitive to the users who will be using your research information and understand the direction that they are going to be going because I think they will be responding to the needs of the market more directly.

So my next question is: was there user input in this process?

Mr. STAUBER. There was broad user input. We have strong representation on the Advisory Committees that existed in the past from various direct farmer organizations. In addition, we received input from a wide array of commodity organizations and general farm organizations.

Mr. ALLARD. Now, I assume that you have had an opportunity to review the conference report in the 1996 farm bill or maybe you have not but are somewhat aware of what is in there as far as research is concerned.

Mr. STAUBER. Yes, sir. I read the whole thing last night.

Mr. ALLARD. Good. Well, you are up to date and ready today, I guess.

Now, the Congress in that conference report authorized the establishment of a national advisory board, and it is made up of users and charged with the responsibility of recommending research, education, and extension priorities.

How does the administration plan to use this board in developing the strategic plan that you have mentioned in your testimony, or maybe you have not had an opportunity to give this thought, but if you have not, at least I would like to have your personal observations and how you might go about this.

Mr. **STAUBER**. Well, I would like to ask Dr. Woteki to talk about how we are going to move forward with fulfilling the requirements of GPRA. The one timing issue that we are working with—we met yesterday, in fact, to begin the process of soliciting names for the advisory committee—is that it will take us several weeks to go through the process of placing notice in the Federal Register and those types of steps that are required by law, but we are going to move.

We want to be in a position upon the signing of the bill by the President to move very, quickly. At the same time, GPRA has set another time line for us, and so we have plans to move forward in the fulfillment of GPRA. What we hope to do—my guess is that the earliest will probably be June—is to bring together the GPRA and advisory committee activities. But if Dr. Woteki could talk about how we are going to get comment and response to the strategic plan over the next five months, I would appreciate it.

Ms. **WOTEKI**. I would like to preface my description of the process that we are using in developing the strategic plan by, first of all, emphasizing that the plan that Dr. Stauber has referred to already is a draft. I have been talking in recent weeks with groups that represent our stakeholders and our partners, and I have also been emphasizing that the process that we are going through right now is a dress rehearsal.

The requirements for the Government Performance and Results Act actually come into full effect at the beginning of fiscal year 1999. So the development of the draft strategic plan has so far been based on a series of consultations that each of our member agencies in the REEmission area have had with their stakeholders and partners.

They have contributed to this overall draft, which will be submitted along with the department's plan to the OMB, along with our budget request, later this summer.

We are planning, once we have our draft at the end of this week, to continue in the consultations that we have been having with the broader research, education, and extension communities and with the users of the information that comes from those activities. We have plans to have a series of listening conferences around the country in four or five major regions in which we will actively solicit the views of people in those areas about the plans.

We also are proposing a series of meetings with our partners in the Land Grant universities and the schools of 1890, and in the extension community, as well, throughout the summer period, and we will be revising this draft plan based on those comments.

We are also going to be talking with the people that work in our agencies to get a broad public review from the people who are actually going to be working with this plan in the future.

So it is the beginning of a consultation. It is not the end.

Mr. **ALLARD**. I appreciate your comments, and thank you.

My time has run out, and so I will pass it on to Mr. Gunderson for further questions, but before I do that, I just cannot overemphasize to you the importance, I think, of consulting with the user. I think this is such an important part of it, and I am glad to hear that you are going to reach out and try to get them involved.

Frankly, the comments that I frequently get is that private industry is so much more responsive to our research needs than perhaps some of the standard institutions that we have established through the Government sector, and I would hope that you would try and be very progressive thinking in putting together the plan and how you can best work with industry and the user to maximize our research efforts to be able to get us to compete in the global market.

I also would make the comment that there is a lot of Republican interest in research. As you can tell, we have had a very good turnout this morning for members of the Republican Party because I think we are really interested in the direction we are going on research and really do care about it.

And so now I will go ahead and turn it over to Mr. Gunderson for his 5 minutes for questions.

Mr. GUNDERSON. What the chairman did not tell you is that each of us wants the research in our particular States and in our particular commodities.

I am struck when I look at the broad based issue of research of how dynamic it is, and my question this morning primarily focuses on how USDA handles the changing dynamics of agricultural research. If I were to ask you to compare the research priorities today with 5 or 10 years ago, how have they changed?

Mr. STAUBER. I have not studied recently what was on the list 10 years ago, so I am going to have to do this from memory.

I think a couple of things have changed in the last 10 years. There is a much greater emphasis today than there may have been 10 years ago on human nutrition and the role that research plays in assuring that we have the safest food supply system in the world. We have to constantly pay attention to new threats that are coming to us through the process of natural mutation or that are coming to us over our borders.

A second area that I would suggest has changed dramatically in the last 10 years—because of significant progress on trade liberalization—is sanitary and phytosanitary challenges. We are spending a lot more time and energy and we have a much higher priority on making sure that we have the research base to protect the long-term production capacity of American agriculture from pests and other problems, being brought in from other parts of the world.

The third area that I would suggest has changed dramatically is looking at how we can use knowledge to help producers, in particular, but really the whole food chain, to balance the profitability interests of those individual producers and the larger concerns that society might have about issues like water quality, soil erosion, those types of things.

So those were all on the list 10 years ago, but as we deal with the changing dynamics of international trade policy or new, unforeseen emerging threats or proximity between suburban areas and commercial producers, these challenges all added or have at least increased in visibility. of those challenges before us.

Mr. GUNDERSON. How much flexibility do you have in administering Federal research programs to respond on a very quick turnaround basis to the changing dynamics of either evolutions and progress in science or a public need for a research focus? What do we need to do to give you more flexibility or do you feel you have sufficient flexibility today?

Mr. STAUBER. Well, I would like to ask my colleagues to comment on that, but just briefly, I think we have substantial flexibility in many of the areas. One of the challenges that exists though is that there is often, because of the nature of the research process, there is a delay between the emergence of an issue and our ability to provide credible scientific response to it.

Mr. GUNDERSON. I do not mean to cut you off, but because the time is running, I am just curious. If the national press were to ask you today are we able to detect mad cow disease in meat and milk, would you be able to say yes or no?

Mr. STAUBER. Mad cow disease in what?

Mr. GUNDERSON. In either meat or milk products. You would say no?

Mr. STAUBER. In cows the answer is yes. Once the cow gets turned into a steak on the rack, the answer is no.

Mr. GUNDERSON. All right. Then if I were to ask the Secretary whether or not we are doing research on this area, would you be able to say yes or no?

Mr. STAUBER. The answer is, yes, we are doing extensive research in the whole area of BSE and related problems in animals.

Mr. GUNDERSON. Okay. Let's just assume that we were Britain and we had that scenario in this country. Would you be able to reallocate funds on an instantaneous basis to respond to that kind of an emergency in research or not?

Mr. STAUBER. Yes, we would, and we have done that on methyl bromide. We have done that on karnal bunt. As long as we have a fundamentally strong research program within our Land Grant institutions and within institutions like ARS, we have the capacity to do that.

If we start to underinvest in those institutions, we will lose that capacity.

Mr. GUNDERSON. You have enough discretionary funds available or the ability under research agreements that you can reprogram to respond to that kind of a crisis should it occur in this country?

Mr. STAUBER. Yes, sir, we do.

Mr. GUNDERSON. That is very helpful. Thank you.

Thank you, Mr. Chairman.

Mr. ALLARD. I think Mr. Gunderson brings up a good point in our expanding global markets contagious diseases, infectious diseases get to be a greater priority because we do have a lot of diseases that occur in other countries that do not occur in this country, and that is one area of my interest. Being a veterinarian, I have a real appreciation for some of your problems in that regard, and I think he brings up a good point.

I would like to now recognize Mr. Peterson and see if he has any questions for the panel.

Mr. PETERSON. I apologize for getting here late. So I am kind of getting in the middle of everything, but your comment about reallocating resources on karnal bunt, could you explain have you done something recently with this latest outbreak?

Mr. STAUBER. We have been working very closely with APHIS and with the Foreign Agricultural Service to make sure that the tools that we already had on the shelf because of past research programs were brought to their hands as quickly as possible. But karnal bunt is a good example of where, because we have had a long-term research program in the whole area of wheat and problems in wheat, we were able to respond in a very, timely manner.

If we had not already done that research and did not have the karnal bunt detection technology on the shelf, it might have taken us a year or two to be in that position. So this is a good example of where, largely due to the foresight of our scientists who were looking down the road and saying, "What are the problems that may be coming into this country from other parts of the world?" We were able to have a quick response to the situation.

Mr. PETERSON. Another problem that we have with wheat up in my country is the fusarium, whatever you call the scientific name of it, and apparently there has been a lot of research done on this particular fungus where it occurred in the root of the plant out West that has been going on for some 20 or 30 years, but we are just kind of getting started on the problem up in our country where it is being manifested in the head.

My question is: has there been any coordination between the research that has been done, you know, where it affected the root or is there any applicability between that research and the problems that we are having up in our country?

Mr. STAUBER. Dr. Horn.

Mr. HORN. Certainly weed pathology has been one of the more important programs of the Agricultural Research Service for a long time, and there is considerable coordination among the in-house laboratories in the Northwest, the Rust Laboratory in Minnesota and a number of others.

By the same token there is a constant challenge to keep up with wheat disease. We have a considerable effort to coordinate also with the efforts of the Land Grant university system, and the National Research Initiative has a category of grants that Dr. Robinson may wish to talk about that relates directly to plant pathology. In fact, the chief scientist of the National Research Initiative, Jim Cook, has taken part in that particular type of research himself.

So there is a strong program, and that is the reason that we have been able to ward off most of these challenges to wheat in the international market and locally. We have not had serious problems dealing with wheat and small grain diseases in general such as we have had in, for instance, strawberries and some vegetables as a result of the threat to methyl bromide availability because we have had a constant program to develop resistance and other solutions to wheat disease problems.

Mr. PETERSON. Well, you know, as it relates to this vomitoxin problem, Jim Cook and I grew up a mile apart on a farm out there by South and Glyndon, and I happened to run into him a couple of years ago, and so what I have done just, you know, as I have met with different people, I have asked if they have ever heard of him and what do they know about his research, and I have not been able to find anybody in Minnesota or North Dakota that knew about him and the research he has done.

So that is why I wonder if there is actually coordination that has happened or maybe I have just asked the wrong people. I am not sure, and I am still not clear. The research that he did, is that in any way transferable to the vomitoxin problem that we are having in the heads of the plants?

Mr. HORN. I will have to ask for a little assistance here.

I am sorry. We may have to get back in touch with you with regard to the details of that. Actually what Dr. Cook has done is significantly to advance the science related to the soil borne diseases of wheat. He is a world authority on that. I would be very surprised if the people in the Rust Laboratory in St. Paul, Minnesota did not know him very well.

Mr. PETERSON. Well, I did not ask anybody in that particular laboratory, but I asked people, you know, in the leadership of the wheat industry and others, and they were not aware.

You know, I have talked with him at some length about this. I think the answer is that apparently he has bred the problem out of the root over 20 or 30 years, and the trouble is that we have got this problem right now. We are going to have a serious problem up in our country if we do not get a good crop here this year or next year. I think probably Congressman Pomeroy has the same kind of trouble over on his side of the river.

Mr. HORN. I think the key to your question is that type of work is still relatively fundamental, and so the customers that Dr. Cook serves are for the most part other scientists, and we will find that kind of cross-pollination amongst the laboratories. They are well aware of what each of the other does, but until we have a basic wealth of knowledge that we can carry to the field and apply, we have really got a problem, and as new diseases come on line or as different variations on the same disease come on line, we can have a difficulty.

Mr. ROBINSON. Perhaps I could add to that just a bit from the point of view of the cooperation between the Land Grant Universities and the ARS labs.

Additionally, Dr. Cook's work has been primarily in root diseases as opposed to head diseases, and the mechanisms are somewhat different. One of the issues at hand is the concentration that has gone on both in the fundamental and applied research areas in root diseases, and not a great deal recently in head diseases because of the incidence of the problem, and we do need to refocus some additional work.

As Dr. Horn points out, there is a need to beef up, in fact, our fundamental research program that deals with this set of issues. We do have a complex set of tools to address the issue ranging from fundamental research through the NRI Program or ARS Program, to the IPM Programs, which contain both extension and research activities of the Land Grants universities. We try to bring together people who are taking the research information to the field, as well as the researchers at the Land Grants universities and the ARS laboratories to try to deal with emerging problems, such as the one that you identified.

Mr. ALLARD. The gentleman's time has expired.

I would now like to call on Mr. Lucas from Oklahoma.

Mr. LUCAS. Thank you, Mr. Chairman.

Dr. Stauber, if we could for a moment go back to an issue that Mr. Gunderson raised, being a beef producer by trade, I feel for my colleagues and the consumers in Great Britain with what has been going on in recent weeks over there that has made the worldwide media, but as I understand it, that has been a concern; that particular disease has been a concern in the scientific community for as much as a decade.

If you could use that as an example just to flesh out for me or whoever on the panel there the process that you folks go through in this particular instance when you learned about the problem over there and the resource allocation and what you brought to bear and use this as an example of how your process works, if you would, for me.

Mr. STAUBER. Thank you, sir.

Dr. Horn.

Mr. HORN. In fact, it is not a matter of going out and trying to find out whether we have the problem in this country as much as it is keeping the problem from ever coming into this country. APHIS made a very wise decision in consultation with research scientists many years ago to block the importation of cattle from areas that are potentially affected. They, in fact, tracked perhaps two dozen animals that had made the trip in one way or another from affected areas into the U.S., and there have been several cases where these have been found and destroyed without the spread of this problem.

It is a histochemical, histological test that can be run. It is something that has been routinely checked in sacrificed animals in this country that might have been exposed to BSE elsewhere, and from all indications, we do not have it.

Mr. STAUBER. But we have had an ongoing effort for over 20 years conducting research in this area, providing the tools to APHIS to make sure that, one, we had the ability to keep the animals out and, two, if the animals somehow get in, we are able to respond quickly. We put the animals down. We do the necessary testing to make sure that, in fact, the animals have not been infected, and to date that has been a very successful program.

It is a perfect example of an area that if, for whatever reason, we start to pull back on our research activities, it will turn around and bite us, and it will bite us in a very, large way.

Mr. LUCAS. So it is safe to say then to both the producers and the consumers that we have been on the ball, we have done our job, and very successful so far?

Mr. STAUBER. Yes, sir.

Mr. LUCAS. That addresses my concern, Mr. Chairman.

Mr. ALLARD. I thank the gentleman.

I will now call on the gentleman from Texas, Mr. Stenholm.

Mr. STENHOLM. I have no questions at this time, Mr. Chairman. I would ask unanimous consent to have a statement inserted in the record at the beginning of the hearing today.

Mr. ALLARD. Without objection, so ordered.

Mr. LaHood.

Mr. LAHOOD. Dr. Stauber, in looking over the administration's budget recommendations, I notice that there is a substantial decrease for the Peoria Lab over last year, and I am wondering if you can explain what accounts for that.

Mr. STAUBER. As you know, you and I visited with the Secretary at the Peoria Lab, maybe 9 months ago. The utilization laboratories, of which there are four around the country, are a very, important investment for the Department of Agriculture. Last year the administration had recommended approximately, I do not have the number in front of me, and I am sure Dr. Horn is finding them, about $8 million in stepped up construction for the pilot plant phase at that laboratory.

We are also moving forward in our long-term plans to renovate one of the major wings of that laboratory. Unfortunately we did not get the full funding that we had requested last year for that component. Some of that money was pulled out at the last minute and put into another facility here in the United States, and so we are coming back this year and requesting the funds that we need to get that modernization effort back on stream.

However, we have some concern. This is a very high priority laboratory for us, but given how tight money is, we have the constant problem in any given year of balancing the allocation of facility improvement dollars across our 100-plus domestic ARS facilities. So while we are asking for less this year than what we asked for last year, that is not an indication of backing away from it. It is an indication of not having enough money to go around for this critical component of what we are doing.

Dr. Horn, do you want to talk about the specifics?

Mr. HORN. Actually there is no program decrease proposed in Peoria. There is one project that is proposed for decrease that passes through Peoria, but the money is not spent at Peoria, and we have a $1.5 million increase for buildings and facilities this year at Peoria.

So I am not sure what——

Mr. LAHOOD. I am talking about the building, and I am talking about the building project, which last year was at about 3 million and now it is down to 1.5 million this year.

Mr. HORN. Well, the Peoria——

Mr. LAHOOD. It was $3.9 million last year.

Mr. HORN. But the Peoria modernization plan is a sequential affair that is planned over many years.

Mr. LAHOOD. Well, but the point is this, that it is sequential now, but I am not sure it was in previous budgets because there was a significant more amount of money in previous budgets, and it was not considered sequential, but apparently it is now.

But do you know what? I will take Dr. Stauber's word on this, that the lab is a significant research facility and has a high priority, and I appreciate those comments, but for this particular construction project, the money is left.

My time is running out here. Let me ask a question about BRDC. Can you tell me what priority that has in your budget? That is also a program that has been funded through your agency, although it is a separate free-standing program. Again, it's a very high priority project in our community, and I am wondering if you have any comments on that.

Mr. HORN. The BRDC program was evaluated this past year and kept in the budget. There are two parts to the BRDC. The one part that involves animal science monies that passed to other States was recommended for close out and redirection. It is part of the $20 million that we were required to redirect, but the principal that stays in the Peoria Laboratory with which we interact with the private sector was kept at Peoria, and in spite of the fact that it was passed through money and there were less overhead costs or costs of closing it out, the in-house projects cost the most to close out because we have people to deal with. It is relatively easy to close out an extramural program, but we did not close that one out because it is extremely important to us.

Mr. ALLARD. The gentleman's time has expired.

I would like to call on now Mr. Johnson from South Dakota, and if the gentleman would like to make a statement for the record, we will allow you to do that at this time and then proceed with your questions.

Mr. JOHNSON. Well, thank you, Mr. Chairman. I apologize for my late arrival.

I have been held up in another matter, but this is an important hearing. I am pleased that you are going forward with excellent panels of witnesses. In order to expedite, however, the hearing process and get on with the substance of the hearing, I would simply ask unanimous consent to submit my opening statement for the record and then yield back my time to the chair.

Mr. ALLARD. Without objection.

Does the gentleman now want time for questions?

Mr. JOHNSON. I have no questions at this particular time.

Mr. ALLARD. Okay. Let me now call on the gentlewoman from Idaho, Mrs. Chenoweth.

Mrs. CHENOWETH. Thank you, Mr. Chairman.

I just wanted to say that you noted the representatives who were here and who demonstrated their interest in this project, and I just wanted the record to show that there were two of us here from Idaho. We also have a witness from Idaho. So Idaho certainly has an interest in it.

My colleague, Mike Crapo, had to leave regretfully because he has to testify on a bill that would require the Congress to put money saved from cuts in agencies against the national debt.

But I wanted to ask Dr. Robinson when it comes to the research agenda most people agree that stakeholders should play an important role in setting priorities. However, there have been some questions as to whether stakeholders should play a role in reviewing individual research proposals.

My concern is does this place science at the mercy of a political agenda. We are not only seeing this in research perhaps, but also perhaps in the Endangered Species Act.

Mr. ROBINSON. You have identified, of course, a very viable point in dealing with both merit review and review of projects for relevance. One of the issues that seems to be the guiding force is the use of stakeholders in helping set research agendas in terms of what the relevant problems are; what the emerging issues are, either short-term issues that need immediate attention and refocused activities or longer term issues that are new as important issues or problems which are impacting upon their commodities, their areas, or particular economic consequences that they may be facing?

Beyond that point, to actually review the projects does begin to interface probably in not the most productive way the most effective role of stakeholders with the most effective role of scientists. The general philosophy that we are operating under is one which is an attempt to interface the best science with the most pressing problems, and in fact, when I first came to the agency I said we should run CSREES on three basic principles, the first being relevance, the second being excellence, and the third being usefulness.

And it seems to me it is in the first and the last where stakeholder groups can make the largest impact in terms of looking at a research agenda, guiding the larger issues and then, in turn, when the researchers and the scientists review proposals on a competitive basis and review a merit review of the progress of those proposals. They are seeking then to address the best science to the most relevant issues.

The next place where I think stakeholders can be of an enormous use is in reviewing the output of that work. In fact, does the work once done, once the best science is interfaced with the most critical problems, actually communicate? Does it communicate with user groups in a way that they can take that information and apply it?

And that is a place where I think we also need to interface the education arm of our agency, adult education and higher education through extension and the Land Grant university system, to make sure that we are communicating the results of the program in the most effective way.

Mrs. CHENOWETH. Dr. Robinson, your answer was very informative. My concern is I just do not like to see political correctness move into the area of science, and so thank you very much, Dr. Robinson.

I yield back the balance of my time.

Mr. ALLARD. I thank the gentlewoman for yielding back the balance of her time.

And now I will call on the gentleman from North Dakota, Mr. Pomeroy.

Mr. POMEROY. I thank the chairman, and I would ask unanimous consent to submit a statement in the introduction of this hearing.

Mr. ALLARD. Without objection.

Mr. POMEROY. Thank you.

Up in wheat country, we are very worried. We have been very worried, as Collin Peterson told you about the vomitoxin. Now we have got midge and, I think, most alarming of all to me is this karnal bunt. Congressman Peterson has told me of your answer to him before I arrived. So I will not take you over the territory again.

This, I guess, is a trade question with a research hook to it. Is there a prohibition on Mexican wheat import for purposes of not exposing ourselves to further taint from karnal bunt?

I know there are other countries on the list, as well, but some of us suspect that is where the Arizona problem came from.

Mr. STAUBER. I am sorry, sir. We will get you the answer to that, but I am not absolutely sure and would hate to mislead this subcommittee based on my knowledge at this point about that.

Mr. POMEROY. Okay. Do you know the answer?

Mr. STAUBER. Anything to add, Dr. Horn?

Mr. HORN. I do not believe there is a prohibition on import. Moreover, we have not, to my knowledge, yet traced this karnal bunt outbreak to Mexico. CIMMYT, of course, is a major source of wheat-germ plasm and it is in Mexico, and this did first appear in seed weed, and we are trying very hard to determine how this came about, but to my knowledge we have not traced that back at this point in time to Mexico.

Mr. POMEROY. Mexican wheat has had that problem, hasn't it?

Mr. HORN. That is correct.

Mr. STAUBER. Wheat out of certain sections of Mexico has had the problem, but northern Mexico has not.

Mr. POMEROY. What is the activity presently occurring to evaluate? I understand you have told Congressman Peterson how you have isolated the karnal bunt in this country. It will be very interesting to see what is done with the equipment and all of that, just dealing with already what is in this country.

But can you tell me anything of the activity going on to assess where it came from and evaluate what steps need to be taken to make certain we do not get any more in this country?

Mr. HORN. There are two tests for karnal bunt. One is a generic test that is about $100 a sample. The other is a more complete test that is about $1,000 a sample.

We are, in fact, testing all of the sources of wheat that may have led to this outbreak in Arizona. Of course, we have identified something, and when I say "we", APHIS is by and large responsible for accomplishing this. The last I heard, about 22,000 acres of wheat in Arizona has become suspect. There were some movements of wheat within the U.S., one to the north, Montana I want to say. There were two ships en route to South Africa, and there were a series of ships in port that had been loaded with wheat that might have come from the affected areas, and of course, our trade partners immediately froze those up on us.

We are considering a number of options. We have already undertaken the training of technicians that could, in fact, sample and assess the spread of karnal bunt. We have provided the technology in order to do that perhaps in each State. We are considering the testing of every elevator in America—there are about 15,000 licensed elevators—and we are negotiating with our trade partners on how we might establish with them an agreement to work on karnal bunt-free parts of the country for export-import of wheat to them.

Mr. POMEROY. It would seem to me that part of that sweeping and extraordinarily important series of actions, a very critical evaluation of wheat import out of Mexico has to be a part of it, maybe, in fact, a first essential part of it. Dr. Horn?

Mr. HORN. We would agree with that.

Mr. STAUBER. Absolutely, and since this was discovered several weeks ago, we have primarily focused on, in effect, identifying what is here and clearing the channels so that trade can continue in an uninhibited way.

It is just this week that the team that we have strong participation in, but is led by APHIS, has begun to focus in a much more significant way on the trace back element of it. That is now underway and will continue to be a major emphasis until we are certain where it came from, we are certain how it got into the country, and we make the necessary corrections to insure that it does not occur again.

But until Monday of this week, we have really been using virtually all of the resources at our disposal to focus on identifying every bushel of it that we can that is in the United States, every elevator it is in, every piece of equipment that has been used to harvest it and quarantine the right acres, and I am very happy to say that the positive test on karnal bunt, when you start one of these things, your great fear is that the positive test will start high and stay high. Well, they started not real high, but they have begun dropping off fairly dramatically.

So we have increasing certainty that we have been able to identify virtually all of the acreage and infrastructure that has been immediately affected by that. Now that is identified, we are starting on a treatment regimen with all of the acreage and infrastructure, and we are also starting on the trace-back efforts.

Mr. POMEROY. I would think it would have been entirely appropriate to have sealed off Mexican imports until portions of the country were cleared.

Mr. Chairman, I know my time is up. I wish some of our urban colleagues had heard this exchange because nothing underscores in my opinion really the multi-billion dollar return that the taxpayers get from investment in agriculture research.

Thank you very much.

Mr. ALLARD. I thank the gentleman.

We have one member of the subcommittee that has not had an opportunity to ask questions, and I will call on her and then I will come back for a second round of questions. I know that Mr. LaHood has some more questions, and then we will yield time to you and any other member of the subcommittee that would like to have a second-round would be privileged to do that.

Mrs. Clayton.

Mrs. CLAYTON. Thank you, Mr. Chairman.

Also I would like unanimous consent to submit my statement later on for the record.

I did not have the privilege, and I apologize for being late, so I did not hear Dr. Stauber's full testimony, but I just quickly went through, and I did see where, indeed, in your book as well as in your testimony, part of your rationale for being is to our economic stability. It says on page 6 of your book, "In addition to improved health is an improved environment, economic prosperity, first rate national defense, and an improved quality of life and safety. These are related ideas in terms of why we think it is good investment for our research."

Given the need to talk about not just safety and health, but also new technology, new methodology in a global, competitive arena, and knowing the vast expense of efficiency for farmers, particularly smaller farmers, is there a body of research or a concentrated effort to begin to assist smaller farmers in meeting both environmental issues that need to be concerned with inputs, as well as with new methodologies?

I know we have methodology for soil and conservation, but are we making a concerted effort to recognize that if we are moving to a global market, we are forcing by the very nature the efficiency quotient at such a large record that small farmers who have farm investment of $2 million or less are not going to compete in this world, and I did not see this in this body of work, and I confess I looked through it very quickly, but I just want to highlight that as a need, I know, in my area.

These are the people who have been in farming for generations, and they are now knowing that if they are going to compete they cannot continue the same methodology because there is no way to have the efficiency and have a profit at the other end.

Is there any way, and some call this sustainable agriculture; some call this new ways of producing, but there has to be a recognition that if we are going to talk about having opportunities for smaller farmers, and I can give you examples of my dairy farmers who have shared with me that they have been in the business now for 3 generations, and they have an investment of $1.8 million, in debt almost $500,000, and do not know whether they are going to be able to hang on, and want to stay in farming. They are looking for new ways.

I know the Extension Service because I have had professionals in Extension Service who are part of my family, but I don't see anybody recognizing that as a need. Would you just share with me what is in the making, given this new reality?

Mr. STAUBER. This is an area that is of concern for the Department and that is one of the reasons the Secretary wanted to do the Concentration Commission that is now in place.

We are asking the question as we look at all of our research: when should it be scale neutral so that it can be used by any farmer, regardless of size? When should it be focused on the largest farmers, the 300,000 farms in this country that produce 85 percent of all food and fiber? And when should it be intentionally focused on smaller producers?

These questions have become part of our internal discussions as we look particularly at some of our more applied work. That is a long-term strategy, not a short-term strategy. I believe that the best short-term strategy we have right now is, in fact, a new extension initiative called managing change. This is an extension initiative that came from the grassroots up. It was identified by extension personnel throughout the country. They proposed it through their system, and it is now an effort that we have embraced.

It is designed specifically to help the farmers that are making the transition away from a reliance on Government payments-whether they be direct if you are a wheat farmer in Kansas or indirect if you are a dairy farmer in eastern North Carolina—make the transition away from those kind of reliances, and make the transition to a much heavier dependence on the international marketplace.

We are in the process of gearing that up right now. Our biggest challenge is to gear it up fast enough so that it makes a difference while farmers are really in the middle of this over the next seven years.

Mrs. CLAYTON. I do have more questions, but I will yield back the balance of my time.

Mr. **Allard**. Thank you for yielding back your time, and I would just make the observation that now all members of the subcommittee have had an opportunity to ask their first round of questions, and we will give members an opportunity to ask a second round, particularly Mr. LaHood and then Mrs. Clayton, but I want the panel to know that I did not plant these questions from the committee, but I have noted that there is an awful lot of interest in disease, both plant and animal, its transmission and biological characteristics.

And I also note that you have indicated that nutritional research had moved up on your priority list, but that might be a little bit out of sync with what the members of the committee interest is because of the strong emphasis in questions this morning on disease, both plant and animal.

So I would suspect that the members of this subcommittee reflect the interest of their constituents and the users. So I hope that the committee will keep that in mind or the panel will keep that in mind.

Now, let me call on Mr. LaHood for further questions, and then I will call on Mrs. Clayton.

Mr. **LaHood**. Dr. Stauber, my interests here are very parochial, as you can tell from my questions, but this Agriculture Lab in my home community of Peoria is very important, and I took note of your comment about limited amount of dollars, but I also took note on page 64 of your budget request that the building and facility request is at about $80 million, which is about $50 million more than you have currently in the current budget.

But I am going to take you at your word on this issue of phasing the work that is going on at our Agriculture Lab at Peoria, but I want you to know this is a very, important project.

Research is very important, but if you do not have the facilities to do it, you cannot do it, and one of the reasons our Agriculture Lab has been successful in Peoria is over a long period of time the Department has been committed to renovation and upgrade and making sure that the facilities are there for the wonderful scientists that we have doing the work there.

So I appreciate your comments, and I want you to know that we will be very mindful in monitoring the renovation that goes on there and the resources that are allocated to make sure that we have a state-of-the-art building so that we can have state-of-the-art research going on there, and I appreciate your comments about that.

Mr. **Stauber**. Yes, sir. We have an $82 million plan for that facility. We are approximately one eighth of the way through that plan. That plan will take a number of years to complete. If we were in the budget go-go days of 20 years ago and we could have dropped in one step $82 million on that facility, I would argue that the facility could not have utilized it in the wisest way.

We are trying to modernize the facility while at the same time maintain the high quality research that is ongoing. You know, we could have, I think, inappropriately made the decision to shut the facility down for a couple of years and completely renovated it. I think that would have been a mistake. I think it is something that our stakeholders would not have been supportive of.

But I would be less than frank with you if I did not say that getting money for facilities in this climate is a struggle. It is a very big struggle within the administration, and it is a very big struggle here on the Hill, and we will need all of the help that you and other friends of that facility can provide to make sure that we continue to have access to the resources that we need for it.

Mr. LaHood. You will have it from this member.

Mr. Stauber. Thank you, sir.

Mr. LaHood. Dr. Horn, can you tell me at what level BRDC will be funded or what your recommendation is in your budget request?

Mr. Horn. $1.6 million.

Mr. LaHood. Thank you.

I note also in your budget request there is a request for $2 million for the Florida Everglades, and the reason I raise this issue is we have a very spirited debate on the House floor on an amendment that was supported by the Speaker and offered by Mr. Foley, who is a member of the Agriculture Committee, to begin the cleanup of the Florida Everglades, and I wonder if this is an additional $2 million than the $200 million that was included in the bill that we passed on the House floor.

Mr. Stauber. We are in a position to talk about the portion of that $200 million that relates to research. I am afraid we are not in a good position to talk about the total package of that $200 million, which includes, I believe, some land purchases, land exchanges, and other types of things.

Mr. LaHood. Is it the same project though? I mean are we talking about the same thing here in terms of——

Mr. Horn. Yes, this is an increase in the research program proposed. It would be relevant to the work that we feel should be done at Fort Lauderdale, Canal Point in Gainesville. It is primarily a biological control of invasive weeds, and melaluca in particular, aquatic weed control, sugar cane production. And you may know that they are looking for water tolerant sugar cane varieties that can withstand some flooding and some plant stress research, as well.

Mr. Stauber. But our request, Mr. LaHood, is for $2 million for this research, which is part of that $200 million package, I believe.

Mr. LaHood. Okay.

Mr. Stauber. But we represent only $2 million of that.

Mr. LaHood. I guess my point is the money that Representative Foley's amendment, I guess, ended up being about $4 million; is that money going to be allocated to the same thing that you have money requested for?

Mr. Stauber. Well, the $4 million is a facility request for a biological control lab to be constructed in Fort Lauderdale to deal specifically with the melaluca problem. So within the total $200 million package, there are two parts that relate specifically to the Agriculture Research Service, $2 million for the specific research that Dr. Horn mentioned and $4 million for this facility.

Mr. LaHood. Thank you, Mr. Chairman.

Mr. Allard. I will now call on Mrs. Clayton to wind up her questioning.

Mrs. Clayton. I wanted just to follow up on a couple of questions. Could you give me some examples of what you understand the Extension Service is now doing as a way to managing their change?

Mr. STAUBER. Dr. Robinson, can you comment on that, please, sir?

Mr. ROBINSON. Yes, Mrs. Clayton, and in fact, we are still in the formative stages of that project. The project has arisen, as Dr. Stauber pointed out a moment ago, because of the enormous difficulty no matter where one sits in the agricultural arena now of adjusting to the immense number of changes that are coming down the pike. Whether that change be changing technologies, size neutral or not, whether they be changes in biological technologies which are, in fact, size neutral, the changes that are occurring in farm programs, for example, you mentioned your dairy farmers. The kinds of changes that are occurring in farm programs; the movement to a market-driven economy as opposed to one that has a greater umbrella of security from Government programs. All of these are influencing decisions enormously.

And what we are trying to do at the moment with a broad-based group of people from around the United States is to try to concentrate on those areas that are causing the greatest problem for the greatest number of people, and we are at the moment trying to focus those issues.

There is a group of people who are combined from all the partners, from the State Cooperative Extension Services and from the Federal partners. This subcommittee is beginning to focus on that set of issues.

Mrs. CLAYTON. I just wanted to acknowledge that I am interested in research for nutrition, and I think as we think about gaining greater support for the agriculture budget as a whole, the more we understand that it is the research that makes our food safe, I think we not only enjoy the agricultural members' support, but I think Congress as a whole.

Sometimes it is difficult for me to explain to my urban friends that the milk does not come out of the cooler they get at Safeway or wherever they get it, but they do understand when their milk is not safe. So the research of that is very important.

Further, I was struck by what I did not quite understand, in fact, probably had some suspicion about, which was the fact that we were exporting chicken that might not be safe. I cannot imagine that we would do that, but help me understand what methods do we have that we would—and I am referring to the issue obviously recently in Russia—is there a method that we ensure in our export of our trade that we, indeed, do have a quality that we have come to rely and boast about that is also transferred as we sell products abroad?

Mr. STAUBER. Speaking a little bit out of the realm of the research community, the sanitary and phytosanitary barriers that are being proposed by the Russians may have much more to do with politics inside Russia than they do anything else.

Mrs. CLAYTON. I suspected that, but I just wanted to——

Mr. STAUBER. I will put the safety of American chickens up against the safety of any chicken coming out of any part of the former Soviet Union any day you want to try and do it.

[Laughter.]

Mrs. CLAYTON. That is reassuring.

Thank you, Mr. Chairman.

Mr. ALLARD. I would even go further than that. I would put it up against any place in the world.

Mr. STAUBER. I would agree with that also.

Mr. ALLARD. We also understand, too, that with poultry there are certain precautions you always have to take in order to protect the human health aspect of it.

Mrs. CLAYTON. Mr. Chairman, just to change the view, I think part of the things that we do have in this global market, we have the safest food and we also have the quality food. So we ought to also emphasize that in our trading and marketing strategy, and so any time there is an incident that suggests otherwise, we should make a big cry about it because that is the one thing that distinguishes our products grown here, is our belief in quality and safe food.

Mr. ALLARD. I appreciate the gentlewoman's remarks on that, and I agree with her and would again make the point we get back into both plant and animal disease and infectious and contagious problems that we have with that and in our food chain.

Let's go ahead and proceed with the next panel. I would like to thank this panel for their time and for their testimony before this committee.

The next panel that I would like to call on is Dr. Martin Apple, executive director of Council of Scientific Society Presidents; Dr. Bill Baumgardt, representing the Federation of American Societies of Food Animal Science; Ms. Kathleen Merrigan, Wallace Institute for Alternative Agriculture; Dr. Richard Herrett, executive director, Agricultural Research Institute; and Dr. Gregory Zeikus, Michigan Biotechnology Institute, and he is being accompanied by Dr. Richard Godown, a senior vice president of the Biotech Industry Organization.

While you are coming to the table, my understanding is that Dr. Zeikus has a plane or you need to leave at 11:30, and so with that, I will give you an opportunity to testify first, and then we will call on Dr. Apple, Dr. Baumgardt, Ms. Merrigan and Dr. Herrett.

I am going to also ask that the gentlewoman from Idaho, Mrs. Chenoweth, chair the subcommittee. If you would, please, I would appreciate it. I need to step out here for a few moments and then come back later.

So, Dr. Zeikus, you will proceed with your testimony, and I will turn the gavel over to the gentlewoman from Idaho.

STATEMENT OF GREGORY ZEIKUS, MICHIGAN BIOTECHNOLOGY INSTITUTE

Mr. ZEIKUS. Thank you, Mr. Chairman.

Good morning. My name is Greg Zeikus, and I am the president of MBI. I would like to thank you for this opportunity to discuss the economic and strategic impact of agriculturally based industrial products. My remarks will cover three areas: first, the importance of continuing to fund research and technology development to manufacture industrial products made from agricultural resources.

Two, I would like to talk about effective mechanisms for disseminating these products into the marketplace.

And, three, I would like to talk about what the Federal Government can do to continue to facilitate this process.

When I speak of aggregate based industrial products, it is a far cry from what we have been hearing about food safety and agricultural production. What I mean is making chemicals, pharmaceuticals, polymers, plastics, fuel solvents, and detergents, making these chemicals and materials needed in industry from agricultural feedstocks rather than from imported petroleum.

Markets for industrial products manufactured from crops have increased dramatically over the last 10 years. Right now we are making about $16 billion worth of fuels and chemicals and materials from agriculture commodity crops. It is predicted by 2020 that we can make a total market of $60 billion by developing and commercializing new specialty chemicals and material products. These products include new biological pesticides that will replace toxic chemicals used in food production, new kinds of fertilizers, other oxygenated and intermediate chemicals, and new plastics and polymers.

We can be making rugs and industrial chemicals from U.S.-grown agricultural crops as opposed to making them from imported petroleum dug out of the ground in the Middle East.

Now, there are three crucial reasons why the United States needs to continue to fund new uses of agriculture crops as raw materials for industrial products. First, we have to reduce our dependence on foreign petroleum. We continue to expand the trade deficit by importing petroleum for use as an industrial feedstock. Fifty percent of all our petroleum is imported. Twenty percent of that goes to chemicals and materials that we can make now with new technologies from agricultural feedstocks.

Now, if you look at what we use some of our commodity crops for, I will just give you one example of corn. When we export corn, we get 5 cents a pound for exporting this corn. If we export 200 million pounds of corn, we receive $10 million. If we use this same corn to make chemical intermediates, such as plastics, we could export the plastic product at $1 a pound, increasing the value to $200 million, which is a 2,000 percent increase.

Just imagine the impact on the trade deficit and the rural economy if only half of our commodity crops were converted to higher value industrial products in new industries located in rural America.

Second, one of our Nation's major strengths lies in the ability to produce agriculture feedstocks for foods and feeds. We have already talked about that our foods and feeds are the safest and have the highest quality in the world, and we need to capitalize on that, but we also need to capitalize and expand the agricultural economy by using agricultural feedstocks to make new higher value industrial products.

Third, there continues to be a nationwide demand for less polluting and fossil resource consuming technologies. Products that are produced from agricultural resources first are renewable, and they are environmentally benign both in their creation and use.

When you have an oil spill, oil kills animals. If you spill corn, you are going to feed animals. Many of the processes that have polluted our country are based on petrochemical processing. If we replace that with agricultural processing, we will have improved safety and environmental quality.

Agriculture must also recapture the higher value markets it lost at the end of World War I when the need for synthetic rubber opened the market for the petrochemical industry. Today we can make synthetic rubber from agricultural crops, such as corn, using new process technologies.

Some of you may be skeptical about cost, but here is a fact most of you do not know. Petroleum and corn, as a carbon feedstock to make industrial products, cost the same, 5 cents a pound with today's prices of both petroleum and corn.

In the future, corn price will go down because genetic engineering will make lower cost plants. However, petroleum is going to rise because of dwindling resources.

Now, there are three phases of innovation that are required to replace petroleum based products with agriculture based products. First, one has to discover new ideas and inventions.

Second, one has to demonstrate their technical and economic feasibility.

And, third, these technologies then have to be transferred to new companies to get the products into the marketplace.

Now, the key discoveries made at universities and our great Federal labs, including the agriculture. labs like the Peoria Lab, must be demonstrated as technically and economically feasible. These efforts, too, have to be funded by the Federal Government. The risk involved with development and demonstration is too great for private industry, and the risk involved with not funding the demonstrations is too great for the U.S. agriculture community international security, and in fact, if we want to get the private partnership and the accountability from doing research, we cannot let research and inventions sit on some university or Federal lab's shelf. We have to take those inventions, develop them, demonstrate them, and get them into the marketplace.

Now, MBI International and a few other organizations throughout the country actually do evaluations, developments, scale-up work. We have helped several federally funded discoveries reach the marketplace. We have created five new companies and three global joint ventures, all operating in the United States with activities in Idaho, Nebraska, Minnesota, and Michigan, and all of the products these companies make are derived from agricultural resources.

In my written testimony I have elaborated more on these products and markets. Here I am just going to talk about two examples. One, this is a fork made out of starch. It is totally biodegradable so that if it falls into the environment, it is not going to clog and pollute the environment or take up space in landfills. It is going to be degraded by microorganisms normally found in the environment.

If I pick up this poster, here is an example of a field trial of a new bioactive compound which is a plant growth promoter, and this is a field trial in New Jersey. Lettuce is grown at the same time in two rows, one with the plant growth promoter, one without. These are natural plant growth promoters that can lower the cost of agriculture production, decrease fertilizer, nitrogen, in half, yet still increase the productivity of the crop.

These are the kinds of new bioproducts that are being developed and commercialized.

Agriculture leaders must help change agriculture's vision. We must promote the use of agriculture resources not only as feedstocks for foods and feeds, but for industrial products. This will greatly expand the agricultural economy and provide a real future for rural Americans since industrial manufacturing jobs will occur in the rural economy close to where the crops are produced to make the new industrial products.

We must also exploit the federally funded discoveries in our universities and Federal labs. To do so we must fund development and demonstration of new agriculture based product technologies. We must fund both the research discoveries at the laboratories, but then very importantly we have a vacuum in the innovation process that we have to fund, and that vacuum is taking a patented invention from a university or Federal lab, scaling it up, economically demonstrating it, learning how much it is going to take to make the product and how much you are going to make from that, and then forming small companies.

The small companies then are the start for making an industrial manufacturing industry next to the farm in rural America.

Now, we have to thank the Federal Government for funding MBI over the last 5 years because if we would not have had the Federal funding, we would not have been able to create these eight new companies. We remain excited about this new vision for agriculture and the creation of a new agriculturally based industrial manufacturing sector.

This new sector will create new manufacturing opportunities in rural areas, reduce the trade deficit, and provide farmers with growing markets for their crops, and I am very concerned with the removal of agriculture subsidies that there are going to be markets that farmers can plant their crops for.

Thank you.

[The prepared statement of Mr. Zeikus appears at the conclusion of the hearing.]

Mrs. CHENOWETH [presiding]. Dr. Zeikus, I want to thank you for your testimony.

It was incredibly interesting to hear about value-added production.

I do want to remind the witnesses unfortunately we only have 5 minutes each, and you have come so far and you have so much knowledge that it is a source of frustration for us, but because there are so many of you, we need to limit your testimony to 5 minutes.

Many of us can help you lengthen your testimony through questions, but I want to thank you very much.

Dr. Godown, I understand you had some comments for the committee.

Mr. GODOWN. Thank you, Madam Chairman.

I will not take 5 minutes since I am supplementing here. I will just take a minute or 2.

The Biotechnology Industry Organization represents many of the small companies that Dr. Zeikus was talking about who take the research and produce products and bring them into the market, and in doing so produce a great number of jobs. We have over 120,000 people now involved, now employed in the U.S. biotechnology industry.

Let me say a major explanation of the earlier and larger investment in the medical applications of biotechnology is simply that as a result of decades of higher cumulative public investment in medical research, the basic scientific understanding of human and mammalian biotechnology and diseases is at a considerably more advanced stage than that for plants and their pests.

The agricultural biotechnology products that are currently in development are derived from the few areas in the field where the basic science is relatively advanced. Many have their origin in transfers of technology and/or trained R&D staff from the public sector to the private.

The time has come to commit a substantial increase of funding for basic agricultural research to broaden and speed up the process of technology transfer. These should be used to complete the Nation's fundamental knowledge base of plants and their interactions with pests in the environment. An understanding of the physiological components critical to yields in major agronomic and food plants could lead to increased yields and a more plentiful food supply.

This understanding can also lead to increased production of value added products by plants for use as industrial feedstocks. By increasing the amount we spend on research, we can build on the United States' current competitive advantage in the technology and so position its farmers and companies to seize the enormous opportunities which are there.

Thank you.

Mrs. CHENOWETH. Thank you, Dr. Godown. Dr. Apple?

STATEMENT OF MARTIN APPLE, EXECUTIVE DIRECTOR, COUNCIL OF SCIENTIFIC SOCIETY PRESIDENTS

Mr. APPLE. Thank you, Madam Chairman and Chairman Allard and members of the subcommittee.

The Council of Scientific Society Presidents is our national science policy and leadership development center. It is the top elected leadership of scientific professional societies. It includes over 100 scientific disciplines and over 1.4 million members of the societies.

We appreciate your consultation with us in your quest to assure that America's world class science community exercises it's unique talents most wisely and effectively. We thank you for your past support of research by this subcommittee.

We are going to address this morning foundational research, that research which serves as the foundation for either expanding the frontiers of our knowledge or as a foundation for future applications toward such goals as a healthy, sufficient, affordable, stable, sustainable, safe food supply; toward enhanced productivity, value, and global competitiveness; toward insuring the quality of the natural resource base for our future generations.

Study after study has shown that the economic payoff of Federal investment in agricultural research has been immense. The direct rate of return, the internal rate of return on each Federal dollar invested in agricultural research ranges from 15 to 50 cents per dollar per year, year after year, with an added indirect secondary or social rate of return in the same range.

Universally high rates of return, such as these, indicate that the money is well spent, in fact, objectively identifying an area of chronic under-investment.

I want to address three questions briefly. Who sets the science priorities and how? Who funds what research and why? And how shall the Government regularly get the best advice?

First, we suggest that the nation set its priorities for Federally funded research consistent with the research having major probability of conferring significant long-run national value and using a bottom-up strategy in identifying needs and setting priorities is our suggestion. We suggest utilizing stakeholders and research users in proposing research priorities and supporting scientists and researchers in deciding the critically important issues in high priority research questions. It is the role of the Federal Government to recognize and effectively utilize these external professionals.

One Federal research priority setting system is damaging to the National interest, and this is the largest disincentive to research breakthroughs and major progress has become the congressional affection for earmarks in the venue of appropriation committees. These earmarks circumvent the rigorous merit review and take money out of the hands of those who are successful in the merit review processes.

These earmarks continually send the message to new scientists year after year: it is not the merit of ideas or accountability for results that makes one successful, but who one knows.

The second question is: who funds what research and why?

The relative roles of business or Federal funding for this approach should be seen as a spectrum of attributes that indicate primary sponsorship, not absolute black or white.

When research addresses a national problem, when it has a long-term need, when it is too high a business risk or requires too large a size of investment to be likely to achieve a single business sponsor, it becomes a Federal role to help the Nation by sponsoring research investment.

If the research has a short-term focus, if it addresses a local or regional problem, if it is a reasonable business risk or if it is a size likely to achieve a single business sponsor, it may not be the Federal role to support it. But there is a middle domain between these two that is often a fuzzy area. It may be wise to develop joint venture models here and determine which ones succeed rather than force arbitrary demarcation in advance of understanding that.

Thus, it is not an issue of providing welfare for corporations, but how we can all work together to support the national interest.

We suggest that we fund federally sponsored research through competitive awards based on merit reviews by qualified experts where the criteria for evaluation are the quality and the prospect of the ideas and their relevance to the agricultural missions, and that we use funding systems that are maximally open to qualified scientists, all qualified scientists, who wish to participate in research in agriculture.

We suggest you fund the best ideas and the best people as the highest priority rather than funding institutions, and that you sustain the scientific culture that increases the probability of quantum leap research.

How shall the Government best get its advice? We suggest time limited, ad hoc task forces composed of small numbers of persons who are the Nation's most highly qualified by substantial achievement and relevant track record to the issue at hand. They should be available to the USDA to tackle the Nation's toughest problems and policy issues on a regular basis.

Processes are needed to facilitate and enable such groups to be appointed, to function, to analyze, to rapidly conclude, to report and to disband. By including sunset clauses for every task force, we will prevent the growth of a number of advisory groups from getting too large or the membership from becoming ingrown, and we continually insure bringing fresh perspectives to our issues when we need them.

Each task force needs to include a wide latitude for how it operates. Prescribing encumbrances and how they do their work will only hamper their effectiveness.

Thank you.

[The prepared statement of Mr. Apple appears at the conclusion of the hearing.]

Mrs. CHENOWETH. Thank you, Dr. Apple.

And I would like to call on Dr. Bill Baumgardt, representing the Federation of American Societies of Food Animal Science.

STATEMENT OF BILL BAUMGARDT, FEDERATION OF AMERICAN SOCIETIES OF FOOD ANIMAL SCIENCE

Mr. BAUMGARDT. Madam Chairman and members of the subcommittee, thank you very much.

I serve day by day in my role as director of Agricultural Research at Purdue University, but I am here today very pleased to represent the Federation of American Societies of Food Animal Science, sometimes known as FASFAS, who did, in fact, have the process of FAIR '95. We appreciate very much the opportunity to be with.

Your committee understands the need for research, education, and also the need for priorities. We would like to share some of our views on that process and offer the FAIR '95 as a useful model to build on.

Two main points that I would like to make in my testimony this morning, first of all, is to briefly describe the key elements of a priority setting process in terms of participants and process, and then finally, I will describe our experiences in this process.

The successful priority setting mechanism for research, extension, and education, in my judgment, must involve three groups, what I would call the UPS group or participants. The users of the activity need to be involved early and often. The performers of the activity have several key roles to play. By performers I mean the scientists, engineers, veterinarians, and others, and all of that must be played out on the stage of societal concerns because if we are not addressing what is important to society or we are not insuring the future of agriculture, food and fiber, in a way that meets their needs, they will not support us and probably should not.

Let me next briefly say something about the process. It is complicated, so I am not going to go into very much depth here and would be pleased to work later with the committee or agencies.

First of all, the process really needs to have a phase that sets broad goals and objectives. During this phase there is a need for a wide net to be cast to seek broad input, and during that process, to allow for interactive dialogue and consensus building.

The second part of the process is the translation of those goals into more specific requests for proposal, and that may well be a multi-step process. It should leave the opening and opportunity for creative and novel ideas from scientists to come forward, as well as very directly addressing the needs of users at the present time.

The third phase in the process would be that of receiving proposals from the performers, the researchers, and educators, and then eventually leading to an award. In that process, I think it is essential to, again, establish the assurance of relevance, but then selecting from the relevant projects those with the best quality of science and approach, that is, having a way that assures both useful and reliable results will be obtained, assuring that the best quality of science and creativity is brought to bear on those problems that have been identified by a larger group.

I would now like to blend briefly the participants into that process, but I think there are a few important things that have been referred to earlier here today.

The clientele users have to be the primary drivers of the process, in my judgment, in terms of first identification of issues, but the secondly, scientists with a thorough grasp of the tools and the understanding of science can develop effective strategies to seek exciting solutions.

It is incumbent on the scientific community to integrate the disciplines into systems approaches where appropriate to address the problems and issues, and we often do not do that well. We must do it better.

I would also point out, however, that advances in science and technology from many disciplines can be used by the keen minds of scientists to produce exciting new opportunities for agriculture, not only addressing today's problems, but also becoming prepared to address issues that may arise in the future. Such will enhance the effectiveness and competitiveness of agriculture on down the line.

In the closing phase of my testimony, I would try to point out that the Food Animal Societies sponsored an activity in 1992 known as FAIR '95. Over 40 organizations were represented in that process, and that can serve as a model. It was successful because it produced a consensus building agenda within the animal-agriculture community. The results of the workshop and the debate that went on is contained in the proceedings, which we would be happy to make available to you if it is not. I suspect you have seen the more popular version of the output of that FAIR '95, which boils down into the goals and objectives, the six goals and objectives identified by that collective group, and they are listed in my testimony, and I think you have these. If you need more of these, I happen to have some with me. We would be glad to leave them with you.

In conclusion, I want to thank the committee for this opportunity. I have tried to indicate the necessity of involving both the user and the scientific communities in a process which will blend the needs of users with the opportunities from science in the context of what society expects from its food and fiber system. The process known as FAIR '95 offers a useful model.

Our organization would welcome the opportunity to work with your committee and the Secretary and the Federal agencies in the development of a streamlined and yet more effective priority setting mechanism for federally funded agricultural research, education, and extension.

Thank you.

[The prepared statement of Mr. Baumgardt appears at the conclusion of the hearing.]

Mrs. CHENOWETH. Thank you, Dr. Baumgardt.

Next we would like to hear from Kathleen Merrigan from the Wallace Institute for Alternative Agriculture.

Kathleen.

STATEMENT OF KATHLEEN MERRIGAN, WALLACE INSTITUTE FOR ALTERNATIVE AGRICULTURE.

Ms. MERRIGAN. Thank you very much.

I would like to begin by just noting the incredible amount of work the members of the committee and the staff have done in the 1996 farm bill and to congratulate everybody on a job well done. If there is anyone in this town or this Nation who questions this subcommittee's commitment to research, holding this hearing on the heels of that big effort is quite eloquent testimony to the importance that you feel for this topic.

Mrs. CHENOWETH. Thank you. The committee takes note of your comment, and we appreciate it.

Ms. MERRIGAN. Thank you.

I would just like to highlight a few remarks from my written testimony. I may be a bit of an outlier in the first remark that I will make, and that is to urge the subcommittee members to consider a series of oversight hearings as opposed to drafting new research law.

The reason that I argue for this is that I see that there is a lot of law there now, inches deep of law. One of the questions that Congressman Gunderson asked Dr. Stauber is: do you have the flexibility to shift priorities when need be? And Dr. Stauber responded yes, and one of the places that I know that gives us flexibility is in the 1965 Act that dictates research: "The Secretary has the authority to do any kind of research to further the programs of the Department of Agriculture." That is a pretty broad grant of authority.

I argue that is a pretty good way of approaching research in terms of prescribing in law what needs to be done and that through oversight hearings the committee could actually engage on a more regular basis with the department in depth on particular subjects that are of concern to the public and the immediate moment, whether it be the outbreak of the disease in Great Britain, whether it be particular new crop uses that are of concern to the members of the committee, whether it be sustainable agriculture and the needs of small farmers in this transition period. The oversight hearings can be a very effective way of teasing out the details.

Research is slippery stuff, and to get to the heart of the matter oversight hearings are necessary so members can roll up their sleeves and talk details.

In my testimony I offer four ideas for oversight hearings that the communities that I work with would be particularly interested in. The first is the whole issue that many of the speakers so far this morning have discussed: stakeholder review of research. How do you bring in outsiders, the farm community, the environmental community, the consumer community to work in concert with the scientific community to decide what it is we should be funding?

Second, what about the social sciences? The social sciences have been, I would argue, under-funded in contrast to the physical sciences, and there are some important questions that need to be addressed today, especially with the industrialization of agriculture and now Freedom to Farm.

We are in a transition period, and there are some questions that our social sciences, especially our economists, can help quite a bit in addressing.

Third, sustainable agriculture is a critical issue. There are thousands of people in this country working on sustainable agriculture, but there are a lot of unanswered questions, and the opportunity to bring in experts from the field and really talk about some of the pressing issues of the day would be quite valuable.

Finally, there is a lot of talk today about accountability issues. One of the issues that we have been very concerned with is conflict of interest problems with recipients of public research grants who may also be working with industry and their neutrality is somehow or at least the perception of their neutrality is compromised.

So with that, I look forward to your questions, and it is an honor to come testimony today.

[The prepared statement of Ms. Merrigan appears at the conclusion of the hearing.]

Mrs. CHENOWETH. Thank you, Ms. Merrigan.

Next we would like to hear from Dr. Richard Herrett, executive director of Agricultural Research Institute.

STATEMENT OF RICHARD HERRETT, EXECUTIVE DIRECTOR, AGRICULTURAL RESEARCH INSTITUTE

Mr. HERRETT. Thank you very much, Madam Chairman.

My name is Dick Herrett. I am executive director of the Agricultural Research Institute and, indeed, am honored to be here to have this opportunity to speak to you about some fundamental aspects of agricultural research that might be overlooked in the heat of budgetary considerations and focus particularly on priority setting mechanisms.

Just briefly on ARI, it is a nonprofit organization with cross-sectional interests in agricultural research. We have members from the academic, government, industry, and, indeed, the public interest sectors. ARI evolved from the National Academy of Sciences in the early 1950s, when it was recognized that industry, indeed, did have an important part to play in research decision-making processes, but at that time, because of the structure of the National Academy, industry was not permitted to participate.

ARI's mission is to provide a forum for its diverse members, to come together in a neutral setting and benefit from the exchange of information on research and research policy concerning agriculture, food and natural resources, and environmental system.

We are active in a wide range of activities. I will just mention two. We, for example, facilitated the first workshop on IPM, a joint effort between EPA and USDA back in 1952. We also participated in what was known as a Biobased Expo, a use of non-food uses from agriculture conducted in St. Louis in 1992.

Why is ARI here today? We are not advocating a particular position, nor endorsing a procedure of financing research. We are here to champion agriculture research by making five rather basic, but we believe important, points.

First, as was noted earlier in Dr. Stauber's statement, the Land Grant system is, indeed, a truly complex system. We cite as an example of what happened in New Zealand when they were to eliminate the extension system as a result of its cost considerations. As a result of its demise, not only did extension lose, but also research because research lost the communication linkage that extension provides on research needs of the consumer.

Second, the time required between discovery and implementation. Again, this was mentioned at 10 to 15 years. I use the biotech example to illustrate. Nineteen ninety-five has been considered a watershed year. Many of the new plant species are being introduced as we speak, but the technology that derives and drives that useful capability was discovered in the late 1950s and early 1960s. So we are looking at somewhere between 25 and possibly 30 years between basic discovery and implementation.

One just has to stop and think of the population extensions into the 2040 period. We are there almost as far as discoveries are concerned.

Third, the need for public research. This is a question that oftentimes is raised. Should, in fact, there be public funding for research programs? If, in fact, they are worth doing, would industry do them?

We would contend that there are areas that cannot be done adequately by industry or even if at all by industry. I cite as an example the boll weevil eradication program. In Congresswoman Clayton's district, for example, years ago there were only about 50,000 acres of cotton grown. Today that is reaching close to a million acres because of a joint effort between State, Federal, and industry researchers to control a very pesky insect, the cotton boll weevil.

In Georgia, the acreages go up to almost 3 million acres as a result of that very effective program. I cite that as an example of joint opportunity.

We have heard from previous speakers about the investment aspect of research as Point 4. Its return on investment can be cited anywhere between 20 and perhaps as high as 35 percent. I am sure you are familiar with those kinds of figures.

Also, the position of global leadership as a consequence of investment.

And the fifth point, there is wide support, regardless of the affiliation or the association, for increasing funding for agricultural research. If one takes, for example, the World Resource Institute, one finds interest in the environment as the driving factor. The Hudson Institute, an interest in increasing productivity to reduce impact on the environment and natural species. Indeed, the Wallace Institute, to provide opportunities and diversity in approaches for crop production schemes, all in support of agricultural research.

So, in summary, I have tried to describe the complexity of agriculture research from an organizational and technological perspective. It is predicated on an infrastructure that is required over 100 years to develop and has demonstrated a track record of moving technology from laboratory curiosity to a commercial product, with an efficiency that equals something on the order of 35 percent per year, year in and year out.

While certainly it is possible to argue there are areas in the system which can be improved, for example, there is considerable need for improving the inputs and methods used to establish research priorities, with clear needs for improved communications between industry and Government. There are four critical outcomes that dictate a need to support a strong research agenda.

First, minimize food costs to 98 percent of those Americans that purchase food, but do not participate in its production process.

Two, to derive maximum return on investment, to generate future revenues.

Three, enhance global competitiveness.

And, four, insure environmental well-being on a sustainable basis.

America's world leadership in food production and domestic food safety and security can only be maintained through a strong and continuing commitment to agricultural research and development.

Thank you very much.

[The prepared statement of Mr. Herrett appears at the conclusion of the hearing]

Mrs. CHENOWETH. Thank you, Dr. Herrett.

I want to thank this outstanding panel for their testimony. Even though there are not a large number of us here, you have produced a very valuable record for us and for the American people.

I do have some questions for you, each of you.

Dr. Zeikus, in establishing your research priorities, the Federal Government must take into account the needs of a diverse array of interests. One mechanism of incorporating user input is the formation of a centralized advisory board. As a representative of industry, how do you see the advisory body process affecting your part of the industry?

And the second question is: what do you see as ways to make the advisory bodies more effective and responsive to your industry?

Mr. ZEIKUS. Yes. I do not know a lot about the advisory board process, but I think it is very valuable. I think it needs to have a vision of where it wants to go and outline a strategy of how to get there, and I think for agriculture, in particular, one has a lot of problems, and they are dynamically intertwined, and I would think that it is a very good thing. I hope it has a good vision and it can focus on adding value to agriculture, and I hope from my own personal viewpoint that it goes beyond production agriculture and it looks to what higher value products can we derive from agriculture and then how do we get there and how do we blend that in with maintaining our leadership in using agriculture for foods and feeds.

Mrs. CHENOWETH. Thank you, Dr. Zeikus.

Dr. Apple, I wanted to ask you in your testimony you mention the importance of scientific merit reviews and the importance of users in setting research agendas. You suggest a bottom-up strategy to identify the needs and to set priorities.

Can you elaborate on that? And would you discuss how the bottom-up strategy would address our national priorities?

Mr. APPLE. Yes, Madam Chairman.

The most relevant models already exist, for example, the National Institutes of Health, the NRI. Such models already have widespread input. The FAIR process we just heard about, where, in fact, you can bring together people who have wide varieties of interests to put an agenda together that says, "These are our national priorities."

The Congress themselves obviously represent widespread interests and can do the same, and we believe that process of bringing everybody's viewpoints forward is very, important in helping us set an understanding of what the Nation's priorities are.

When it comes to the final process of deciding about research grants, about proposals, reviewing them, and evaluating them on the basis of scientific merit, we have a strong belief that that process should be nonpolitical and should be very highly developed by the scientists, as it is in all of the most effective research units in the Government.

Mrs. CHENOWETH. Thank you, Dr. Apple.

I wanted to ask Dr. Baumgardt what are some of the key aspects of food-animal integrated research for 1995? That would be FAIR '95. That would be particularly applicable to organizing a national priority for setting mechanism for all Federal research programs.

Recognizing that FAIR '95 was designed for the animal science community, are there any specific aspects of FAIR '95 that might not work for programs across the spectrum of research?

Mr. BAUMGARDT. As I indicated, I tried to present FAIR '95 as a model and chose not to go into great detail about the specifics of its application for food-animal agriculture. However, I think the process is very applicable to most sectors of science as they relate to needs, and that process involved not just oversight hearings, which are very valuable at times and is a better way to get input than none at all, but oversight hearings and the process engaged in in FAIR '95 have this difference: that in the FAIR '95 process we actually took a bit more time. It is a greater commitment of time on the part of participants, but engage them with one another and with a background of presentations of where the science stands, where the needs stand, and where the challenges were, so that they can then interaction on a discussion workshop basis and finally bang out and discuss with each other and arrive at those broad, over-arching goals that might be achieved.

I think that process is applicable to many areas of science.

Mrs. CHENOWETH. Thank you, Dr. Baumgardt.

Kathleen Merrigan, I wanted to thank you for your suggestion of oversight hearings. We have taken note of it, and the committee would like to work with you on further suggestions on that. It is a great idea, and it needs to be done.

Kathleen, realizing that the amount of time and effort put into research proposal process, would it be more efficient to acquire user input on priorities before requests for proposals or RFPs are developed instead of after proposals have already been submitted?

Ms. MERRIGAN. I think that doing it up front is a very good idea. When you are thinking about what to spend money on in science, it is really a two-step process. One is: is it scientifically doable? This is when you get the experts in the room and undergo peer review in order whether a project is scientifically feasible. Is it going to elucidate interesting information that we need in the scientific world?

The stakeholders also have a part in that, and they say, "Is it something, considering our limited resources," and everyone who is speaking here today is acknowledging the fact that it is going to be a time of dwindling budgets for public research and that is a concern, but is it what we really want to spend our limited resources on?

And as long as that process happens so that it is effective, it can happen at different points in the process, but really up front is a very good way of doing it, where you say these are the three or four topics that really should be highlighted from a user point of view that we really need to do research on, and then the scientists go forward and take that next step, and within those categories say, "Okay. When we look at the wealth of proposals, what is it that really works and achieves those objectives?"

Mrs. CHENOWETH. Well, along that line, in your written testimony you mention the need and the importance for enhanced weed science. I am particularly interested in that. Would you mind elaborating on this need?

Ms. MERRIGAN. I am stunned when I go out in the field talking to both scientists and farmers by the consensus they express for the need for more public funding for weed science research. Part of the problem, to be frank, is in our colleges. There are a number of industry sources for funding where they will provide funding at a graduate school to help professors and students do research. Usually this research money though has to do with particular products, Herbicide A, Herbicide B, or the development of a herbicide tolerant crop.

So for those weed scientists, for those graduate students, and for those farmers who are interested in finding non-chemical alternatives or more focused on integrated pest management programs where chemicals are a part, but not the whole solution, they are finding that they have not the resources to do that kind of research.

So I am concerned that the money is not there to be doing that kind of public sector research. It is not up to industry to be doing that. That is why we have public spending in research, to do some of that job.

And, second, we are graduating a whole new crop of students, if you will, who have not had the time and the investment put into their education on non-chemical or cultural practices that will help in the control of weeds.

One of the things I submit in my testimony was a survey of organic farmers. That is just one niche kind of farming in this country, but it was overwhelming to me their response in terms of the need in weed science. It is just an area where we have so many questions and so little answers.

Mrs. CHENOWETH. Very interesting. Thank you, Kathleen.

Dr. Herrett, I wanted to ask you when discussing agricultural research, it is important to take into account the relationship between the public and private sector. Some people argue that public sector research is disconnected from the private sector and does not go far enough in making the connection between fundamental and more applied science.

Others believe that public sector research goes too far in giving the corporate world tools and technology that should be developed by the private sector.

What are your thoughts on the relationship between the public and private sector regarding agricultural research? I would like for you to go into this in more depth.

Mr. HERRETT. Well, first, I think there needs to be enhanced communications, as I have said in my testimony. The dialogue between the public and private sector, I think, needs to be enhanced. Both are facing a reduced resource base. Therefore, the planning, the establishment of where both are trying to go needs to be much better understood between the two, if you will, private sector and public sector activities.

I have mentioned the boll weevil eradication program as an example of where public and private sector came together to resolve a very significant problem. I think this is an excellent model of how that can be perhaps achieved in areas, for example, in some of the weed control areas that Kathleen was just mentioning in which some of the basic research, which industry really neither has the capabilities nor the resources to do, in some way needs to be able to use that to judge how to use their technology more effectively, and by the same token, I think the public sector needs to have a better understanding of the limitations of what industry is capable of doing.

Neither one can do everything. There is no question of it. They need a better opportunity for dialogue and communication.

Mrs. CHENOWETH. Thank you, Dr. Herrett.

I want to thank this fine panel for your valuable information.

Excuse me, but I see, Dr. Apple, did you have a further comment on that?

Mr. APPLE. Could I make one comment, please, Madam Chairman?

Mrs. CHENOWETH. Yes.

Mr. APPLE. Your question had to do with setting priorities, and one of the ways you asked it concerned me, and so I wanted to comment to it if I could.

Mrs. CHENOWETH. Please do.

Mr. APPLE. This morning we had a discussion about the cow disease. That is now on the front burner in terms of the public interest and understanding. If we started today to make that decision that that is important, we might have to wait 20 years before we could do something about it.

It was because we had research that, in fact, was prioritized by scientists over 20 years ago that we now can understand the connection between something called scrapie in sheep and the mad cow disease in the CJD in humans. That research was carried out because scientists created a set of priorities based on what the frontiers of knowledge had available to them and how they could understand where things could develop, and it only became important to the public literally today.

I think, therefore, it is very important to understand the crucial role that scientists have in setting priorities because of a different perspective and an ability to understand things differently from their particular base of knowledge.

Thank you.

Mrs. CHENOWETH. Thank you, Dr. Apple. That is an excellent point.

And I again want to thank the panel. Dr. Godown, did you have a quick comment?

Mr. GODOWN. A 30-second observation, if you will.

Trying to sum up what all of us have been saying here, obviously we all favor additional research and research which has scientific merit, and it would seem to me that the easiest and most direct way you get there is through competitive grants and through peer reviewed research, and if we keep those principles in mind, we will get where we need to go, and we will see the benefits of new technology, such as biotechnology, being brought to the fore.

Thank you.

Mrs. CHENOWETH. A good point. Thank you, Dr. Godown.

And, again, thanks to the panel for your very valuable testimony, and I want to remind you that the record remains open for 10 days if you want to add anything to your testimony.

Thank you, ladies and gentlemen.

Our next panel that I would like to call to the witness table is Dr. Ron Marler, president of the Association of American Veterinarian Medical Colleges; Dr. Barbara Stowe, past chairman of NASULGC, Board of Human Sciences; Dr. John Abernathy, past president of the Weed Science Society of America; and I want to welcome Mr. Joe Anderson from Idaho, first vice president of the U.S. Canola Association.

Mrs. CHENOWETH. I do want to make a comment for the record that the only farmer of the day was put last on the witness list, but, believe me, that doesn't mean that you're not first in our hearts and our concern. So it was a simple oversight by staff, and I hope you'll forgive us, Mr. Anderson.

I'd like to call first on Dr. Marler, president of the Association of Veterinarian Medical Colleges. Doctor?

Mr. MARLER. Thank you.

STATEMENT OF RONALD MARLER, DEAN, KANSAS STATE UNIVERSITY, COLLEGE OF VETERINARY MEDICINE, ON BEHALF OF THE ASSOCIATION OF AMERICAN VETERINARY MEDICAL COLLEGES

Mr. MARLER. Let me make a correction. I'm not the president, but I'll correct that here shortly.

I want to thank you for the opportunity to present testimony to the subcommittee as you begin to examine possible changes to the agriculture research component of the farm bill. I am Ron Marler. I'm the Dean of the Kansas State University's College of Veterinary Medicine. And I am here today testifying on behalf of the Association of the American Veterinary Medical Colleges, the AAVMC.

The AAVMC's mission is to coordinate the affairs of the 27 U.S. veterinary medical colleges, departments of veterinary science, departments of comparative medicine, and the animal medical centers, and to foster their teaching, research, and service missions Nationally and internationally. I have a few points to make on behalf of the AAVMC.

Animal health research must be supported for the following reasons. Animals and related industries contribute in excess of $100 billion to the American economy. Healthy animals produce safe food, a better environment, and improve animal and human well-being. A solid animal health research base is vital to the health and well-being of both the animals and the people in our society and the industries that revolve around these animals. It is essential to ensure the continued safety and the wholesomeness of America's food supply.

The Department of Agriculture needs to increase its spending on competitive research programs which target animal health and disease and rural health problems. The competitive research funding should lead to the development of new veterinary medical research programs and should continue to support the existing research base. One advisory board should be established to allow for input into the Federal agriculture research agenda.

A second issue, animal agricultural research should focus on food safety. Foods derived from animals are essential to health and well-being of the American citizens. While the U.S. produces the most abundant and safest food supply in the world and food-borne diseases are associated with only a very small fraction of the total food consumed, the Food Safety and Inspection Services estimates that there are as many as 7 million cases of food-borne illness a year, with 7,000 deaths, and that these illnesses result in $3,700,000 in health care costs and job-related absenteeism annually.

While veterinary medicine historically has been an important component of the post-harvest phase of food safety through the USDA's food safety and public health responsibilities, it is also vital to producers to address the pre-harvest or the production phase of food safety on farms. On-farm animal disease control and food safety programs need to be developed that maintain healthy animals and that will lead to production of high-quality foods that enter the food chain free of microbial and chemical contaminants.

Research must be done to develop effective and comprehensive monitoring and surveillance systems for the effective control of food-borne diseases. In addition, research must be utilized to develop rapid, simple, sensitive, and specific diagnostic techniques for identifying food-borne hazards.

Third, research should focus on enhancement of the global market. With the passage of the North American Free Trade Agreement, NAFTA, and the General Agreement on Tariffs and Trade, GATT, the opportunity to expand the export of animal food products has increased, but such expansion can occur only if the animals producing this food are healthy. Veterinary medical research will optimize animal production systems to yield abundant, safe, high-quality, wholesome, and nutritious food that will successfully compete in a global market and provide scientific information for the control or elimination of animal diseases that may lead to nontariff trade barriers.

Targeted research funding is also critical for success. This support is important for the development of new technology and products, their testing in the field, and their transfer to producers.

Fourth, the USDA must spend more on animal health research. Clinical veterinary medicine derives its strength from a solid base in animal health and disease research. Livestock producers most often rank animal disease as their primary problem in limiting the economic return on their labor and investment. Research leading to more effective control of zoonotic diseases in all species of animals plays a major role in the protection of both the animal health and protection of human health.

Over the last 2 decades, there has been a resurgence in the occurrence of infectious diseases in both animals and people. In addition, there is increasing evidence that antibiotic drug resistance has reduced the effectiveness of animal and human disease therapy. Concern is being raised about the source of the resistance factors and whether antibiotic use to prevent disease in animals may increase the appearance of antibiotic resistance in human pathogens.

Veterinary medical institutions are particularly well-qualified to address new and reemerging diseases because of their experience in the diagnosis, epidemiology, pathology, microbiology, toxicology, and disease control of many species. Targeted research funding is critically needed to identify these existing and potential disease threats.

Fifth, research should focus on the well-being of animals. A coordinated effort involving veterinarians, food animal producers and industries, the scientific community, Governmental agencies, and consumers of animal products is needed to successfully resolve public concerns related to the well-being and humane care and use of farm animal species. Establishing guidelines for the care of animals in the production environment is especially challenging because economic feasibility is essential to survival of the production unit.

Veterinary medical researchers in association with animal scientists are well-trained to contribute to the studies designed to provide the quantitative data needed to realistically assess recommendations for changes in the integrated production management systems, which include health monitoring and disease prevention.

Research should focus on animals in the environment. The potential for various chemical and microbiological hazards in recycled wastes that affect domestic animals and people remains a constant concern. Veterinary medicine is often the first to be called upon when environmental disasters involving free-ranging wildlife, marine, or aquatic species occur. Veterinary medical diagnostic laboratories are called upon to identify the cause of death and to evaluate the potential threat of these disasters to animals as well as people.

Environmental toxicology/epidemiologic investigations are needed to assess the health hazards of environmental pollutants and establish the cause and effect relationships.

Last, I'd like to address the Stakeholders Advisory Board. The AAVMC strongly supports the establishment of one advisory board which allows the stakeholders to have input into the Federal agricultural research agenda. The board should reflect the desires of consumers, the needs of producers as an attempt to provide products to meet societal needs, and the judgment of professionals, who know what science and technology can provide in this joint effort.

I appreciate the opportunity to review for the subcommittee the critical issues that face academic veterinary medicine today. And on behalf of the AAVMC, I would like to thank you for your continued commitment to the betterment of the U.S. agricultural industry. Thank you.

[The prepared statement of Mr. Marler appears at the conclusion of the hearing.]

Mrs. CHENOWETH. Thank you, Dean. I appreciate your being here.

Barbara Stowe is the past Chairman of NASULGC. Would you explain to the subcommittee what those initials stand for?

Ms. STOWE. That's the National Association of State Universities and Land-Grant Colleges. We inside call it NASULGC.

Mrs. CHENOWETH. Thank you, Dr. Stowe. Would you proceed with your testimony?

Ms. STOWE. Thank you very much.

STATEMENT OF BARBARA S. STOWE, ON BEHALF OF THE BOARD OF HUMAN SCIENCES, COMMISSION ON FOOD, ENVIRONMENT AND RENEWABLE RESOURCES, NATIONAL ASSOCIATION OF STATE UNIVERSITIES AND LAND-GRANT COLLEGES

Ms. STOWE. My name is Barbara S. Stowe. And on a day to day basis, I am Dean of the College of Human Ecology and assistant director of the Agricultural Experiment Station at Kansas State University. This testimony is on behalf of the Board on Human Sciences.

That group is comprised of administrators that have responsibility for research, extension, and resident instruction programs addressing vital issues of family and community, human nutrition as it impacts health, food safety, conversion of agricultural products into food and non-food uses, human development throughout the life span and other related issues. When we have that series of responsibilities, it does imply that there will be some appropriate mechanisms in place for determining what the needs and the interests are on the part of people and then how to translate these into curricula, research, and extension programs. I'd like to address some changing needs as we have seen them within rural America.

The land-grant university is linked to the people through the educational infrastructure, which is the Cooperative Extension Service. This is an extension presence, and there is one in every county, which not only delivers research-based information to the citizens, but which delivers back to the university the needs and interests of the people being served. Extension programming is also guided at the local level by citizen advisory boards, which are representative of the population. And periodically land-grant universities conduct scientific surveys, public forums, focus groups to identify the issues and priorities for our own strategic planning purposes and program redirection when that is called for. It is through these surveys and listening sessions that we know that the issues are changing.

Now, consistently over the past 5 years and across the country, here are some of the issues that have been identified as high priority: maintaining viable communities; improving the local economy; maintaining strong, healthy families in a safe environment; assuring health maintenance and an available, affordable health care system; balancing agricultural productivity and protecting the environment.

What you did not hear in this priority list are issues of agricultural production, technology, and marketing. There has been a significant amount of research conducted on agricultural production issues. And, of course, this has greatly benefited U.S. society and the economy. So it is not because these issues are not of importance to rural America but that our research, extension, and educational systems have perhaps been attending to these issues better than to some others. This may be due, in part, because families and communities generally do not have strong and organized advocacy as does agricultural production.

This Congress has been at the forefront, we believe, of concern for identifying State and local needs and designing appropriate mechanisms to support those. Those responsible for research and extension programs in the land-grant university system share Congress' concern. Through numerous surveys and other advisory mechanisms, we find that changing rural America is signaling a need for research and education in some different areas. We would identify those that we think do support the agricultural enterprise in its broader sense.

I know that it is argued that issues related to rural families, health, nutrition, community viability, and so forth, are not strictly agricultural issues. First let it noted when advisory boards and community groups are asked to identify priority issues, farmers, ranchers, producers and processors of agricultural products are represented on those advisory boards and in the survey samples. Farmers, ranchers, and others who constitute the agricultural enterprise live and rear their families in rural America. They are concerned about economic viability and quality of life for their families as well as markets for their products, conservation of the soil, availability of the water supply, and so on. They understand that all of these factors are interrelated.

For the next couple of minutes I want to focus on some of the specific areas of research and extension programming which have been identified as changing needs and which if supported would positively impact the whole agricultural enterprise.

I would list first nutrition, food science and food safety. Both research and education. The major shift in health care is toward health maintenance and disease prevention. This requires a much better information system on diet in relation to health. The land-grant university system in partnership with USDA is in the best position to relate human nutrition to the quality of the food supply. Food scientists work in collaboration with nutrition researchers in developing food products which meet nutritional needs and then use biotechnology to develop and modify the agricultural raw materials into marketable nutritious foods. Higher education is educating dieticians who are becoming much more active members of the health maintenance organizations across the country. The availability of quality, low-cost health care is a major challenge for rural communities. Hence, health maintenance is important.

There is a significant Federal role in nutrition research and education. The metabolism of nutrients in the body to ensure health is common across the human species. Therefore, developing Federal guidelines that support nutrition is very cost-effective.

Family and community issues. Fewer and larger farms have changed the community structure of rural America. They want to rear their families in a positive small community atmosphere, but they're finding it very difficult with limited educational and other community services. And probably as critical as any is limited living-wage jobs, which lead to dual-career households and then the necessity of caring for children and sometimes elderly in other ways.

One size does not fit all in this case. Research is needed to model successful small community development and organization. Strong families are a source of an available qualified workforce and, hence, the agricultural enterprise. And, thus, we need to be sure that when we are designing programs for rural America, that these are high-quality wage-earning jobs for the people of that part of America.

Value-added has been discussed considerably this morning. That is a critical factor in rural America because many entrepreneurial fields of endeavor can be developed in rural America with leading edge technology that's now available to convert agricultural products to not only food, but also non-food uses and turn those over in a competitive way.

Telecommunications has also been mentioned briefly before, but electronic communication is a very powerful tool for linking disperse populations. In the State of Kansas, we are aware of that because many of our people live in very small communities and far apart. Our researchers, extension staff, and faculty need support in determining how most effectively to serve our clientele with the new media. Everything that is on the Web is not research-based quality information in a usable form. So land-grant researchers and extension workers are going to work to try to convert that new media into a way that is an educational one.

These are examples of areas not generally well-supported in USDA budgets but are vital to the changing needs of rural America. So we strongly urge that the House Agriculture Committee, as you are working to formalize the 1996 farm bill, provide the means to support these and other priorities that have been identified by rural America as critical to the agricultural enterprise. The funds that may be made available through changes in commodity support policy should, of course, show benefit to farmers, ranchers, their families, and their communities.

This is a new opportunity to address some new and changing issues, to provide support for critical issues not currently being fully addressed. Those of us in the land-grant university system are eager to work with Congress and USDA in providing the research base and the extension programs which will best be supportive of rural America and the total enterprise.

We do thank you very much for this opportunity and look forward to some questions.

[The prepared statement of Ms. Stowe appears at the conclusion of the hearing.]

Mrs. CHENOWETH. Thank you, Dr. Stowe.

Next is Dr. John Abernathy, past president of the Weed Science Society of America.

Mr. ABERNATHY. Thank you, Madam Chairwoman.

STATEMENT OF JOHN R. ABERNATHY, ON BEHALF OF THE WEED SCIENCE SOCIETY OF AMERICA

Mr. ABERNATHY. I sincerely appreciate being able to testify this morning on behalf of agricultural research and priority setting. My name is John Abernathy. I am a resident director of research and professor of weed science at the Texas A&M University System. I am testifying today on behalf of the Weed Science Society of America, a nonprofit professional organization comprised of approximately 3,000 individuals and organizations involved in weed-related research.

We appreciate the opportunity to provide testimony during this review of research priorities, especially since weed science has become a neglected science in the recent years. The decline in the priority given to weed science has occurred in spite of the importance of weed management to production agriculture.

Weeds pose one of the most important threats to our supplies of food and fiber and constitute an enormous economic burden in all agricultural areas. Losses in both yield and quality of crops due to weeds as well as the costs of weed control affect the probability of production agriculture. Animal grazing is also threatened by toxic weeds.

The estimated average annual monetary loss by weeds in 46 crops in the United States was $4.1 billion. This figure was determined using best management practices along with appropriate herbicide use. If herbicides were not available, the annual loss would be 5 times greater or $19.6 billion.

Several of the recently established National goals and initiatives for production agriculture have wheat management as a core component. The integrated pest management initiative has a goal to utilize integrative pest management practices on 70 percent of cropland by the year 2002. Since approximately 70 percent of the pesticides used in U.S. agriculture are herbicides, weed scientists must be engaged in IPM research to accomplish such a goal.

Another National priority is the conservation of natural resources. Perhaps the greatest and most permanent damage to the environment caused by agriculture is through soil erosion. The greatest single cause of soil erosion is tillage and cultivation. The major reason that farmers till and cultivate is to control weeds. In the United States, there is a rapid shift to reduce tillage, conservation tillage, and no tillage systems. The biggest impediment to this transition is in adequate weed control.

An important aspect of natural resource conservation is pesticide risk and use reduction. Herbicides and their degradation products are the most common pesticide contaminants of surface and groundwater. This is not surprising because, again, herbicides comprise a majority of chemical pesticides used in U.S. agriculture. However, when compared to research funding for pesticide reduction and nonchemical approaches for insect and plant pathogen management, relatively little funding has been available for comparative research in the area of weed science.

High-priority research areas in weed science that will contribute to herbicide use and risk reduction include: No. 1, biological control of weeds, No. 2, precision application or placement of herbicides; No. 3, computer decision aids for minimizing herbicide input; No. 4, determination of environmental fate of herbicides and different weed management systems.

Non-native invasive weeds are a growing problem in both agricultural and nonagricultural lands. Robust and virulent imported weeds, such as leafy spurge, spotted knapweed, purple loosestrife, and tropical soda apple have become major problems in very short periods of time. Research to discover and develop management or even eradication options to deal with these unwanted immigrant weeds is of high priority.

I would now like to address the priority-setting process and the need for increased coordination among Federal and State partners. In light of intense discussions on research priority setting and in view of the Committee's plan to draft new research legislation within the next 2 years, I would like to especially focus on the critical issues that were debated and not resolved during the past few weeks.

Stakeholder input. Agricultural research serves a number of clients and customers. Farmers, processors, commodity and farm groups, agribusinesses, environmentalists, and public interest groups are all stakeholders and beneficiaries of the research that is supported by USDA and the land-grant universities. We feel that it is critical that stakeholders have a place in identifying their concerns and priorities so that their needs are appropriately addressed.

In Texas we have begun a process called the Texas Agricultural Summit that has involved over 1,800 people during the last 3 years to prioritize research and the issues for the future of Texas agriculture. These are stakeholders from environmental groups, agribusiness, producers, Government, media, et cetera.

The peer review process also is critical. It was established to make sure that the best science is funded and to prevent the awarding process from becoming subject to political or personal agendas. While the process can be improved, peer review has played a critical role in protecting the integrity of the research process.

During the past few weeks there was a debate regarding the inclusion of stakeholders on peer review panels. The challenge is to work out mechanisms that allow for both objectives, stakeholder input into priority setting and science-based peer review. These should not be contradictory objectives.

These hearings and the promise of future legislation create opportunities to address the challenge. The Weed Science Society of America would welcome the opportunity to work with the Committee and the full array of interested parties in devising new mechanisms that meet all of our objectives. Again, I thank you for the opportunity to provide input for the Weed Science Society of America into this review process. We look forward to working with you in the future.

Thank you.

[The prepared statement of Mr. Abernathy appears at the conclusion of the hearing.]

Mr. ALLARD [presiding]. Thank you, Dr. Abernathy.

Mr. Anderson.

Mr. ANDERSON. Thank you, Mr. Chairman.

STATEMENT OF JOE ANDERSON, FIRST VICE PRESIDENT, U.S. CANOLA ASSOCIATION

Mr. ANDERSON. Mr. Chairman, members of the subcommittee, I am Joe Anderson, a farmer from Potlatch, Idaho and first vice president of the U.S. Canola Association. I want to express my appreciation for the opportunity to appear before you today.

Mr. Chairman, the role of the Federal Government in agricultural research and education has traditionally taken two distinct paths: to address broad National or regional concerns through Federal agencies like ARS and ERS and to address regional and local concerns through the land-grant universities.

This dual approach has served the needs of agriculture very well in the past. It has provided tools necessary for supplying the most healthful, most diverse, and lowest-cost food supply in the world. It makes possible exports of not only raw products, but value-added products as well. And this has happened with a lower per capita expenditure for research than that of most developed countries.

However, as technology markets and public perception have changed, agencies have broadened their areas of involvement. User group interests, political considerations, and administrative zeal have all led to a less than clear statement of the role and mission of various research units.

This diversification of interests by research providers has been coupled with an erosion of Federal funding. As a more diverse clientele becomes involved in trying to influence the research agenda, the issue of focus becomes even more difficult. Cooperation and collaboration among scientists receive little reward.

Over the years the funds for problem-solving types of research, so critical to profitability and competitiveness, have been severely reduced. It has been increasingly difficult for scientists to attract funds to do research in such areas as variety development, agronomy, and integrated pest management. At the same time the need for this type of research has never been greater. Our foreign competitors have seen this opportunity. They have solved production problems. They have reduced production costs. They have increased market share.

There has been an increasing tendency to set our research priorities and agenda in Washington. These Federal priorities have become too general and too broad to address problems that are specific to regions and local areas. But production agriculture is local.

The competition for funds may become more acute, but a system must be designed that enables limited funds to be efficiently programmed and targeted. Differences and similarities that exist throughout the country must be recognized. Unnecessary duplication must be eliminated. But to maintain competitiveness and achieve profitability in production agriculture, regional and local problems must be addressed and solved.

For many types of research programs, the proper role of Federal Government must be to provide an incentive for the research community, including both Federal and State, producers, and industry to work together. The time has passed when the Federal Government could be relied on as the sole funding source for research programs, but Federal support can and should provide the leverage to bring various stakeholders and fund providers together in coordinated and cooperative efforts that address the critical problems facing production agriculture.

The Federal Government should target the research and education funds to encourage State universities, Federal scientists, private industry, and producers to pool resources, allocate responsibilities, and share information on a regional level to solve problems that are significant to the producers in that region.

Priorities should be established at the regional level by producers and industry in cooperation with the scientific community. Best scientific practices should be ensured by regional peer review. It is essential that information gained through regional efforts be shared Nationally, and every effort for interregional cooperation must be sought.

The National Canola Research Program has been developed using the principles and priorities I have outlined. It provides the science and education base for products that are increasing in demand for a healthful and nutritious diet, not only in the U.S. but worldwide. The objective is to utilize a limited Federal appropriation to encourage efforts by farmers, State universities, State departments of agriculture, Federal agencies, and private companies to establish and participate in a Nationally coordinated but regionally managed science and education program for the benefit of canola.

The Federal Government cannot and should not play a dominant role in funding and managing agricultural research and education programs. The National Canola Research Program clearly demonstrates that a relatively modest Federal appropriation can serve as a catalyst to stimulate funds from State appropriations, producer check-offs, private company investment, and various other sources to build an effective system for science and education for U.S. agriculture.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Anderson appears at the conclusion of the hearing.]

Mr. ALLARD. I want to thank the panel for their testimony this afternoon and, Dr. Marler, particularly welcome you with the Association of American Veterinary Medical Colleges.

I have a general question for the panel to respond to. In view of what you see coming in the area of international trade, in your particular disciplines, would you give a brief overview of what you see the main issues would be in an international trade arena? And in view of this subcommittee's interest in agriculture being competitive worldwide, what might be your recommendations to the advisory panel in that regard?

So, to try and repeat my question and make it brief, we're interested in the main issues on international trade that you deal with and how we could do to make sure that American products can compete in a world market and we don't run into a rule or regulation that would prevent us from competing.

Why don't we start with Dr. Marler? And we'll just go to the right.

Mr. MARLER. I'll briefly sum up, I think, the situation that we had recently with salmonella in poultry. And the Russian market probably highlights the issues that we face in veterinary medicine in general, especially as it relates to food safety.

I guess I would continue to urge that we need to move forward very quickly with HACCP. We need to take a very hard look at ISO 9000 and what the USDA and other departments in the Federal Government can do to move forward those issues.

Clearly I think we want to make sure that our food supply is safe. I don't think there's any question about that. But we've got to be very vigilant about what we'll refer to as non-tariff barriers, such as the issue with salmonella.

Mr. ALLARD. And salmonella is what I'm looking for, specific examples. Can you give us some more specific examples? I'm going to press the rest of the members of the panel to give me specific examples. Are there any other? I think scrape or the Mad Cow Syndrome would be another. Are there any other specific examples?

Mr. MARLER. The PRRS in swine with the Mexican market I think would be another one, another example.

Mr. ALLARD. Very good. Thank you.

Dr. Stowe?

Ms. STOWE. Probably the area that our community would have the most to contribute to international trade related to agriculture is in value-added. We work pretty much at the consumer end of the spectrum of food production. And a lot of mistakes can be made and a reduction in market share if we are not aware of the interests and concerns of consumers that we want to sell the products to.

In our own university, in my own college, for example, we have a very active sensory analysis unit. What that means is that we're looking very carefully all the time at various cultures, various age groups trying to determine what are the characteristics of the food products. And more and more people all over the world want finished food products in addition to the raw material.

Mr. ALLARD. And, like with Dr. Marler, I'm going to push for specifics.

Ms. STOWE. Okay.

Mr. ALLARD. Can you give me some specific examples of value-added products or where your research area might be applied?

Ms. STOWE. Well, let me say if we were interested in selling pizza on Taiwan, we would need to know—and there is a large pizza company that has recently moved its headquarters to Texas but is still very active in the State of Kansas. There was a great deal of interest in determining what kind of specific food products might meet a market.

Taiwanese people generally do not eat a lot of cheese. So if this may seem small in detail, it can be very enormous in terms of an available market without designing a product, trying to create a market for it, but having a better idea of what the market would want.

Mr. ALLARD. And that's a good specific example. Can you share any more with us?

Ms. STOWE. Well, let's see. Pasta is certainly becoming much more of interest across the world. And wheat is a pretty important product in the State of Kansas. And I noticed that it's important to some other members of this panel as well. Of course, we know that wheat is not just wheat. And so there are characteristics in the biotechnology of the wheat product that are going to make it more applicable for pasta or some other kinds of applications. And we work on those things as well.

Mr. ALLARD. Thank you.

Dr. Abernathy, can you give us some specifics?

Mr. ABERNATHY. Regarding global competitiveness of American agriculture and the impact that weeds or control of weeds might have, it is absolutely imperative that the American producer be able to control the weeds in his fields adequately and the cheapest he possibly can. On a global market, everybody is in competition in that regard.

Some of the things that would be very helpful as we look ahead to the future are investing in integrated pest management, especially weed management, and how those tools could be woven into systems of agriculture, of conservation tillage, reduced tillage systems that would give our producers cutting edge technology.

Other things out there that will happen are including precision application of chemicals. We need to look forward to the future and invest in that also as this is the coming wave, the new technology that will allow us to very precisely apply chemicals across vast areas of land.

Perhaps another example would be biotechnology and the impact that that will have on growing crops and control of weeds in those crops with genetically altered plants that make them resistant to specific herbicide, thus allowing more efficient weed control.

Mr. ALLARD. Can you give me some specifics on what weeds do you see as the greatest risk as far as competing in the international market? Which pesticides would be most helpful or of greatest risk and also which biotechnology specifically?

Mr. **Abernathy**. Gee, how long do I have?

Mr. **Allard**. Well, if you can just briefly give some idea.

Mr. **Abernathy**. From a specific weed standpoint, whatever crop we're talking about, be it corn or wheat or cotton or other crops that are grown in this country, all of them have a list of weeds that must be controlled. Some of those are weird out-of-the-way weeds, but a lot of times it's the common weeds, mustards or pig weeds or foxtails, that we have been working on for many, many years. They have to be controlled as we go forward.

As we change systems of agriculture, those weed spectrums change also. And so we have to change accordingly. Specifically, with different pesticides and herbicides in this case, we're seeing a change, I believe, in some of the chemicals that are used in some of our crops. And that's being driven by several reasons: new chemistries, biotechnology, and other reasons.

But the herbicide glyphosate, or Round Up, if you wish, is finding its way into more and more areas because of biologically altered crops, such as corn, such as cotton, such as soybeans, labeled in soybeans and cotton at the present time. This will enable a compound such as glyphosate, being one of the safest herbicides in terms of environmental impact, to be used, probably more safer than it could have been in the past.

Mr. **Allard**. Thank you.

Mr. Anderson?

Mr. **Anderson**. Mr. Chairman, in terms of international trade and what kinds of things our science and education community may be able to help with in facilitating that trade, in making us competitive in a world market, harmonization of regulations amongst trading partners, pesticide regulations, regulations dealing with products, both value-added products and raw products, that are developed as a result of biotechnology, a number of these kinds of things that can and do and will create artificial barriers to the movement of our products into international markets.

Our science, and particularly our education, capacity has the ability to help provide background information for our trade negotiators to work with our regulatory agencies to try to develop cooperative programs with our trading partners to try to bring some semblance of order, if you will, to the vast array of regulations that are out in the marketplace.

Mr. **Allard**. Do you have some specific examples for this Committee?

Mr. **Anderson**. Well, in terms of canola, which I represent U.S. Canola Association, we are importing 90 percent of our Nation's needs for canola oil in the form of either seed or oil. There are pesticides that are registered for use in Canada which we do not have registered here. That puts the U.S. producer at a competitive disadvantage.

The question also arises—and we in the canola industry feel there's a very great danger if it becomes a trade issue. People will question whether or not products should be imported into the United States that have had pesticides applied that are not available for use in the United States.

Mr. ALLARD. Is Canadian canola the main source of our imports?

Mr. ANDERSON. Yes, at this point in time, it is. And we would urge that it not become a trade issue, that we work towards having common standards for pesticide registration. And obviously we as canola producers would like to have the same tools available that the Canadians do.

Mr. ALLARD. Thank you.

I'm going to go ahead and call on other members of the subcommittee now. Mr. Smith?

Mr. SMITH. Thank you, Mr. Chairman.

As a former council member of the National Science and Technology Council, I have been and continue to be concerned with the kind of research that's undertaken that results in other countries having a greater advantage from those research results than our own country. And I would just like to throw out a question to the panel.

In terms of productivity, in terms of continuing a strong agricultural industry in this country, do you see that we should be concerned? And is it possible to design research in such a way that it better fits our demographics, better fits our way of food and fiber production, it better fits overall? I guess is there a way that we can be more selfish in designing our research projects so that a greater advantage of those projects can be realized, at least in the short run, by this country and the farmers and ranchers in this country? Let's start with a veterinarian.

Mr. MARLER. Thank you.

I'll sum by saying that I think that if you went out and talked to most producers today in the animal industry, they would say disease and disease control are probably a major limiting economic factor to them. They seem to be cropping up almost as we sit here. There was an extensive discussion on BSE this morning. What will the next one become?

I worry, I guess, from the veterinary medical point of view, especially about antibiotic resistance. You're now starting to see this in human medicine quite extensively. And you're now waiting to see it in veterinary medicine. When our armamentarium for antibiotics runs out, how will we control disease process? There was a period——

Mr. SMITH. Dr. Marler, because I'm sort of limited on the time, would you react to the idea: Can we be more, for lack of a better word, selfish in designing our research so it's more applicable here and so the investment of the American taxpayer in developing this research can realize a greater return from that investment, as opposed to a lot of the existing research is utilized and actually implemented in other countries ahead of being implemented in this country?

Mr. MARLER. Again, I'll try to give a simpler answer to a complex question. If I were to suggest focusing in one area, it would be infectious diseases. If you want to be selfish with the money and the effort that you're going to put in, especially in veterinary medicine or as it relates to animal health, it clearly is in the area of infectious diseases. I think the solutions that we thought we had for infectious diseases, we have now found out that we don't have them.

And I would say selfishly I would put the money in basic research and in infectious diseases.

Mr. SMITH. Dr. Stowe, any comment?

Ms. STOWE. Well, I would comment, I think, that our selfishness might be to be more competitive. And we've got to know what the other people in the other countries want, what their markets are, so that we can better prepare products that will be chosen by the people in other countries.

I would emphasize again I think we should not overlook the notion that we need to sell finished products. There are more and more markets as people in other parts of the world, dual-career families, and so on, rather than working from the raw product, making everything from scratch, as we used to say, at home; people are buying finished products. We have and could have a tremendous edge on the nutritional quality of those foods for people in other countries.

So, in sum, I would say let's understand what people want, understand markets, and be competitive.

Mr. SMITH. Dr. Abernathy?

Mr. ABERNATHY. First of all, I would say that in the United States, we have an excellent research in the land-grants and other universities and in ARS as it deals with agricultural research. And we don't have to take a back seat to anybody else in the world in that regard.

Mr. SMITH. But they utilize our research sometimes and implement it ahead of us according to some of the research.

Mr. ABERNATHY. That could be possible, but the same thing is true. We may pick up research from Europe or other places and utilize it in this country.

I've had the fortune of traveling a lot in Europe especially. And a lot of the research that's done in the United States is I think far ahead in terms of agronomic research that puts our farmers a jump ahead in that regard. But we have to be very careful.

And, just like has been said, we need to know what those programs are and what those needs are. And collectively in this country—and that involves stakeholders—we need to do a better job of planning and making sure that we are indeed still ahead of the game.

Mr. SMITH. And Mr. Anderson?

Mr. ANDERSON. Mr. Chairman, Congressman Smith, I believe that we have an opportunity, actually. There are some very good research efforts going on around the world. We as American farmers need to have very fast access to that information. The way that I believe we need to access that information obviously is we've got to cut a deal.

Whatever we give, we want to get back more than we give. And I think that from what programs I'm familiar with in USDA in terms of science and education, that seems to be the objective. However, in some of the other programs that are handled by the Federal Government, the objectives seem to be somewhat different.

And, again, I think it comes back to a trade issue. We need to negotiate tougher and smarter in order to get more than we give.

Mr. SMITH. Thank you, Mr. Chairman.

Mr. ALLARD. Thank you.

Mr. Crapo?

Mr. CRAPO. Thank you, Mr. Chairman. I'll be very brief. In fact, rather than ask a question, I'm just going to make a brief comment and then pass the time to Mrs. Chenoweth, who has been patiently waiting here while I slipped off to another hearing.

I just wanted to say thank you to Mr. Anderson for coming today. He's from Idaho. Actually, he gets to be represented by Congresswoman Chenoweth, but we both welcome you here today, Mr. Anderson.

I appreciated your testimony, in which you explained how we can properly utilize Federal research dollars to coordinate and bring together people from the private sector, from associations, from other sources, like the university systems and so forth, to run an effective research program. I think that the research program that is undertaken with canola is a very good example of how it ought to be done.

Representative Chenoweth and I have both been very closely involved in trying to make sure that the National Canola and Rapeseed Check-off Program is implemented and made effective. And we appreciate the opportunity we have had to work with you.

With that, Mr. Chairman, I will yield my time to Mrs. Chenoweth. She can use the rest of mine and hers if she would like.

Mr. ALLARD. Mrs. Chenoweth, you have Mr. Crapo's time plus your time.

Mrs. CHENOWETH. Thank you, Mr. Chairman. Thank you, Mr. Crapo.

You know, since I have all of this brainpower up here at this witness table, I am going to ask some personal questions about research. Dean Marler, one of the most frustrating problems that we have in Idaho is the transmission of the brucellosis bacteria from the wild game herds in Yellowstone to our domestic cattle. My State has spent over a million dollars of State funds trying to control this. Is there anything that research has turned up on the horizon that might be an effective inoculation against this Bangs disease?

Mr. MARLER. I'll keep my answer very short. No.

Mrs. CHENOWETH. I have a particular interest in this. What do you recommend? What can we do?

Mr. MARLER. It's a part of the statement that I didn't fully get to today. But the control of diseases in wildlife is extremely difficult, as you're well-aware. One of the most popular methods of disease eradication is, in fact, what had been contemplated in the U.K. And that was destruction of the entire population of the cattle herds there.

I don't think anyone would entertain that in the case of deer. It, in fact, would be very difficult, but it does, in fact, highlight a significant problem. There had been some isolated incidences of tuberculosis being reported in wildlife now. These become very severe, again, as we get to the issue of antibiotic resistance and if, in fact, this now spreads.

It is extremely difficult to control diseases once they occur in wildlife populations other than eradication of the source. And obviously in the case of deer and brucellosis, that's going to be extremely difficult.

I think we're going to have to look at surveillance, continued surveillance, of the disease condition. Should it get completely out of control, then I think there are going to probably need to be very serious measures entertained.

At this stage, it appears to me—and I'm not familiar fully with Idaho—that it is in somewhat of a status period right now in the wildlife and in relationship to domestic animals out there. But it is a very significant issue.

Mrs. CHENOWETH. Dean Marler, the idea of inoculation of our domestic livestock, is that clear off the map of possibilities or is research looking or are scientists looking into this?

Mr. MARLER. Relative to brucellosis?

Mrs. CHENOWETH. Yes.

Mr. MARLER. I wouldn't say that anything is ever clearly off the map. And I guess I'm a firm believer that, given the proper resources and freedom, science can resolve most all of our problems.

Where are the priorities? I think that's the issue that's going to result. If you put enough money into an area and you get enough people excited about it, I'm firmly convinced that science can resolve the problem. I would say at this stage we're probably not close.

Mrs. CHENOWETH. I just want to say one thing, and that is that Kansas might become alarmed if we reintroduce Yellowstone elk into the plains once again.

Dr. Stowe, I wanted to ask you: You mentioned the wheat markets and the pasta. In Idaho our soft white wheat is being marketed to the Pacific Rim. And we're hoping to get more soft white wheat into China, but the TCK Smut issue is creating a big political problem, probably more of a political problem than scientific problem. Can you shed any light on that?

Ms. STOWE. I'm sorry. That's out of my realm of expertise. As I indicated earlier, we get from the consumption perspective on what people are interested in. We work very closely with the people who are the producers and the developers. But I would be out of my realm right now if I tried to address that. Someone else. I'm sorry.

Mrs. CHENOWETH. I don't think it affects the Kansas wheat grower as much as it does those of us in the Northwest and Canada. So you're lucky.

Ms. STOWE. In many ways. Thank you.

Mrs. CHENOWETH. Dr. Abernathy, another personal question about Idaho. We're having a great problem in southern Idaho with the leafy spurge. Somebody brought it in. It's just expanded greatly recently. Can you shed any light on that particular problem that we're having? Its root system is such it's very hard to control. It kills everything else around it. And it's an awful weed.

And one of the problems we're having, I've got to say, is that many people are buying seeds from noxious weeds and planting them in their gardens because they have pretty flowers.

Can you help me out there?

Mr. ABERNATHY. To answer your question, no, I cannot. As weed scientists across the country, we do well to keep up with our weeds in our own backyard. We know that leafy spurge is a serious problem for you. It and other noxious weeds across this country do get introduced. And, like you alluded to, taking those pretty flowers and planting them in your garden is how a lot of weed problems across this country got spread in the first place.

You have some excellent weed science people in research and extension in your State. And they would be happy to give you some update on that, I'm sure.

Mrs. CHENOWETH. What kind of developments have been furthered in terms of handling weeds that have a riby root system? That seems to have been——

Mr. ABERNATHY. Well, specifically perennial weeds, like leafy spurge and like many of our other perennials that we deal with across the United States in agronomic crop production, seem to have evolved in the last several years, primarily because of the cropping practices that we use.

When we have a perennial weed, it does have a different type of a root system that enables it to come back from year to year, be that a root or be it a tuber or be it whatever. That does cause an additional challenge in trying to control it, as you can imagine, trying to find a way to kill that perennial part under the soil. The best answers that we have come from herbicides.

I mentioned glyphosate earlier or Round Up has been a magnificent compound developed that will translocate, if you wish, down into the root system of many of our perennial wheat species. And that has helped a tremendous amount.

The developments of other molecules in the last several years have also aided in that regard. We wish there were biological control mechanisms, et cetera. And there are some leads and some hopes out there for perennial weeds but very difficult to find that.

Mrs. CHENOWETH. Thank you, Dr. Abernathy.

Mr. Anderson, again I just want to personally express my pleasure at your being here and how very proud I am of the Canola Association. I remember from having lived in Idaho for so long when canola was hardly a crop at all. And through research and growing and strong marketing, it's a very deep source of pride for Idaho agriculture.

The National Canola Research Program sounds like an effective mechanism to bring a cooperative effort to bear on productive challenges. Can you explain in a little more detail how this mechanism works at the regional level?

Mr. ANDERSON. Yes. Mr. Chairman, Congresswoman Chenoweth, a science base was identified fairly early on by the players in the canola industry as being critical to allow the crop to develop to its full potential in the United Sates. In trying to determine how to structure a program, National program because the crop was being grown we didn't know for sure where but scattered around the country, it didn't make much sense to try to have full integrated programs in each State where the crop was being grown or somebody thought it might be grown. And, likewise, it didn't make much sense to have a centrally managed program when we didn't know for sure where the acre was going to evolve.

So the thought was that let's provide a small pool of money, make it available to the regions, various regions, where the crop was thought to have the greatest potential. Within those regions, then, consortiums of universities were put together that had an interest in doing work on canola and had already demonstrated an interest by utilizing some of their own funds.

There are advisory committees, both industry and technical advisory committees, in each region that call for proposals from the—well, set priorities in terms of what kinds of things are critical to the development of the crop in that particular region.

Once the priorities are set, proposals are called for. They're evaluated from the standpoint of relevance to the priorities and also from the standpoint of scientific excellence. The funds are then awarded on a competitive basis, based upon how well they fit the criteria.

Then each of the regions has a representative on a National coordinating committee. National coordinating committee has responsibility for gathering information from each of the districts, disseminating the information around the country to each of the regions, and to try to look at ways that regions can cooperate.

Our idea is that we know that there's not going to be all of the funds available to do agriculture research that any of us want to do. And so we're going to have to find ways to work tougher and smarter and do it collectively, collaboratively, and cooperatively utilizing the resources that are available.

But the glue that we believe kind of sticks this thing together is that with a small Federal appropriation, we can provide a stimulus for universities to put in some funds, for grower check-offs to put in some funds.

The National Canola and Rapeseed Check-off program has just been passed by the Congress, and we're very appreciative of that. That will give us an opportunity to put some of our money in it. The State of Idaho has also passed a State check-off now. Private companies are developing products. And I believe with a cooperative effort, we can certainly have an effective science base for canola.

We also believe that while this mechanism would not work for all programs in science and education for agriculture, it certainly may have merit in terms of some of the other commodities.

Mrs. CHENOWETH. Very good. Thank you, Mr. Anderson. Thank you, Mr. Chairman.

Mr. ALLARD. I thank the members of the subcommittee for their time this afternoon. I thank the panel for your much appreciated testimony before this subcommittee.

I would ask unanimous consent that the hearing record remain open for 10 days. And without objection, that is so ordered. The subcommittee stands adjourned.

[Whereupon, at 12:25 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

STATEMENT OF DR. KARL STAUBER
UNDER SECRETARY
FOR RESEARCH, EDUCATION AND ECONOMICS
U.S. DEPARTMENT OF AGRICULTURE
BEFORE THE
SUBCOMMITTEE ON RESOURCE CONSERVATION, RESEARCH, AND FORESTRY
OF THE
COMMITTEE ON AGRICULTURE
UNITED STATES HOUSE OF REPRESENTATIVES

March 27, 1996

Good morning. Mr. Chairman and members of the Subcommittee, thank you for the opportunity to present the Administration's views on the future of USDA's research and extension policy. It is my understanding that while the House and Senate Conference Committee approved several changes to the Research Title in the Farm Bill, the various authorizations of appropriations for agricultural research, education and extension programs and activities contained in the Research Title are effective through fiscal year 1997 with the intention that a comprehensive review of research policy would be conducted sometime in the next 2 years.

The Administration is pleased with many of the research and extension related provisions that were included in the Farm Bill Conference Committee report, most notably, the consolidation of 3 general advisory boards into one National Research, Education and Economics Advisory Board, the creation of a task force to examine the capacity of Federally-funded agricultural research facilities, and authorization of the Fund for Rural America. We intend to move quickly to implement these and other provisions upon enactment of the Farm Bill.

We welcome the opportunity to proceed with a full review of research and extension policy in accordance with this Subcommittee's intentions. However, given the dramatic changes in commodity programs and the subsequent changes anticipated for production agriculture and rural communities, it will be even more important that we have a modernized and refocused research and education program to provide the tools necessary to respond to these changes. The time is ripe for a public debate about the future of research and extension policy. We believe that research and extension policy is just as important as commodity program policy. We urge the House of Representatives to act before the August Congressional recess, and you can expect our full participation and cooperation to achieve this goal.

Agricultural research, extension and education have played critical roles in the development of our nation's food and fiber industry. Technological innovations did much to support expansion of agricultural production in the 19th century, and research has been the driving force of production growth in the 20th century. This investment has benefited farmers as well as consumers who enjoy the most abundant and affordable food supply in the world.

One hundred years ago, American agriculture was radically different than it is today. In 1890, 24,771,000 Americans -- or 42.3 percent of the population lived on the farm. There were 4,565,000 farms with 623 million acres in production, and the average farm was 137 acres. Congress created the modern agricultural science system with the establishment of the land-grant university in 1862, the addition of experiment stations in 1887, the minority-oriented land grant universities established in 1890 and the system of county-level cooperative Federal-state extension service in 1914. It is because of these public institutions that U.S. agriculture grew from subsistence farming to a major American industry known for its ability to export around the globe.

Public support of agricultural research marks the beginning of almost two hundred years of the social contract between scientists and the citizenry. Agricultural research is the original model encompassing Federal research laboratories, land grant universities and affiliated Experiment Stations and the Cooperative Extension Service. These publicly supported research and education institutions created around the turn of the century have served agriculture very well. But are these same institutions, with their current organizational and funding structures and priorities, capable of serving us well in the next millennium?

Today, agriculture is no longer the major source of employment in rural America, it is no longer the major source of income for the majority of farmers, and the average farm household annual total cash income from farm and non-farm sources in 1987 was higher than the national norm for all households. In 1990, only 3,871,583 Americans (1.5 percent of the population) lived on farms. Compared to 1890, we have less than half as many farms (2.14 million) but they use 1.5 times as much land for an average farm size that is 3 times as large (461 acres). American consumers have never experienced famine. U.S. agriculture produces an abundance of food -- in excess of our domestic needs and requiring overseas markets. Although some farmers have experienced economic prosperity, many people have left rural areas because of a lack of economic opportunity. However, farming and those industries that process and market food and fiber products represent one of America's largest economic sectors, and agricultural exports are critical to the United States' balance of trade.

Challenges Facing Our Research and Extension Capabilities

The confluence of several factors threatens the short-term basis of public support for research, the mid-term competitive capacity of America's farmers, and potentially the long-term stability of America's food supply. Continued investment in agricultural research is threatened by: declining public dollars for agricultural research, the challenge to make research relevant to an increasingly suburban population, and the demand for greater accountability for public investments in research and extension and public benefits.

The Prospect of Flat or Declining Public Funding: Federal appropriations for agricultural research, accounting for inflation, have remained flat since 1980. The drive to achieve a balanced budget by the year 2002 will require significant cuts in discretionary spending. Under the 7-year budget resolution and the President's budget, the Department of Agriculture is expected to reduce its budget by at least 20 percent within 4 years.

The prospect of flat or declining levels of Federal spending for research and extension comes on top of similar reductions in many states. The 1990s began with 33 of 50 states running budget deficits. California, Oregon, Washington, Minnesota, and Wisconsin have all cut their support of traditional agricultural research during the last five years.

We also see a pattern in some countries of disinvestment in public agricultural research and development. There are several examples of national governments that have cut support for public agricultural research by 25 to 50 percent in a short period of time. It has happened in Canada, New Zealand, Australia and the United Kingdom.

Fiscal year 1996 was the first time Congress cut funding from virtually all segments of agricultural research. If the predictions for a stagnant become a reality, researchers and extension personnel working today will not see higher Federal budget levels in total for their programs throughout the remainder of their professional careers. To put it another way, today's generation of scientists, laying the foundation for the next generation of agriculture will be forced to work with yesterday's tools.

The public agricultural research system is highly decentralized, and this model has served to boost agricultural productivity to the level of success that we enjoy today. There are approximately 107 Federal Agricultural Research Service (ARS) facilities spread throughout the United States (and a few overseas), 76 Land Grant universities, 46 National Agricultural Statistics Services offices often co-located with state departments of agriculture, 57 State Agricultural Experiment Stations (in many states the experiment stations are at multiple sites -- if all individual sites were counted the total number would be above 200), and Cooperative Extension Service offices in almost every county in the country staffed by over 16,000 non-Federal employees. In times of uncertain Federal resources, increased economic competition, and questions about the roles of Federal agencies, we have to ask how many of these facilities and locations can we afford? How many do we need? Would greater reliance on regional approaches be more appropriate in an era of constrained Federal dollars?

Decreasing Political Support Among An Increasing Suburban Majority. The year 1990 may have marked a watershed in American demographics. The 1990 census showed that the majority of American citizens now live in metropolitan areas of more than 1 million people. Since 1950, the vast majority of metropolitan growth has been suburban. In 1992, for the first time, the majority of all votes cast for President were from suburban districts. California, the most suburban state, now has nearly as many votes in the electoral college as the Union's 15 least-populated states combined. If one looks at the entire U.S. population, roughly 22 percent live in rural areas, 30 percent reside in urban cores, and 48 percent call the suburbs home.

These demographic shifts are producing attitudinal and political shifts with serious ramifications for agriculture and research policy. Most Americans can no longer make the connection between an abundant supply of food in their neighborhood grocery store and what happens on the farm. Because of this, it is difficult to generate political support for publicly-funded agricultural research.

Demand for Greater Accountability. The political power base of agricultural research organizations traditionally has been the farmer. Farmers want solutions to their problems and if the agricultural research community wants to maintain the support of commercial farmers, it will have to continue to provide answers to problems. If publicly-supported research is perceived as narrowly focused on a single objective, commodity or specialty, it will be increasingly difficult to convince skeptical non-farming taxpayers that the work is in the broader "public interest." Will the public continue to support agricultural research if the primary focus of public agricultural research is increased farm productivity and the public perceives the benefit as limited to farmers? Or will the public demand additional public benefits like safer food or improved water quality, and will this justify billions in public support?

To respond to these challenges to USDA's research, extension, and education capabilities, we should have a balance of efforts that provide a multitude of public benefits simultaneously. As we proceed with this effort to review our national research and extension policy, I propose that we discuss a new set of goals that society is demanding of public research and extension. Possible issues include:

- supporting the transition from dependence on commodity programs to markets;
- increasing economic opportunities for a greater number of businesses in production agriculture and less concentration of economic power in relatively few hands;
- providing environmental benefits from agriculture for all Americans (water quality, soil quality, etc.) in a non-regulatory environment;
- maintaining world leadership in agricultural and food sciences;
- improving the safety and nutritional value of food; and,
- increasing international trade.

These three threats -- 1) declining public budgets, 2) decreasing political support among an increasingly suburban majority and 3) the demand for greater accountability from public research and extension -- are forcing the agriculture research community, especially those of us at USDA, to provide cogent answers to the following critical questions:

When is agricultural science and technology in the public interest?
When is it in the national interest? (rather than state or local interest)
When is it a national priority?
Who can best undertake the needed work?

We have begun to address these threats and seek answers to these questions by undertaking several new initiatives. We also expect to be better able to respond to these questions by implementing the provisions authorized in the new Farm Bill. In addition, we propose several new innovations for your consideration.

Creating an Outcome Oriented Research, Education and Economics Agenda

Research and education at USDA are organized under objectives based on legislation that has been renewed and amended periodically since the late 1800's. For example, the research categories of ARS are organized according to six areas: 1) Soil, Water and Air Sciences, 2) Plant Sciences, 3) Animal Sciences, 4) Commodity Conversion and Delivery, 5) Human Nutrition and 6) Integration of Systems. A seventh area, called "Information Sciences", was recently added to reflect the inclusion of the National Agricultural Library within ARS as a result of USDA reorganization. The challenges facing agricultural production in the future are more complex than simply an "animal" problem or a "plant" problem. We have gained a greater understanding of the relationships among and between plants, animals, soil, water and air, as well as humans that operate as a system. Agricultural research should be organized to better reflect the integration of the biological, physical, and social sciences to address future agricultural research problems as systems--without compromising the important contributions of disciplinary research.

Under the direction of the Government Performance and Results Act (GPRA) of 1994, USDA is required by law to convert from a process of budgeting and planning based on "inputs" to a system that holds us accountable for performance and outcomes. There are five priority outcomes that we propose for a focused research agenda for the Research, Education and Economics mission area. They are:

- An agricultural production system that is highly competitive in the global economy.
- A safe and secure food and fiber system.
- Healthy, well-nourished children, youth and families.
- Greater harmony between agriculture and the environment.
- Enhanced economic opportunity and quality of life for citizens.

These five outcomes form the basic direction for all of our future research, education and economics programs and activities. We have been working over the past several months to develop a first draft of our 5-year GPRA Strategic Plan. In fulfillment of the GPRA, beginning with Fiscal Year 1998, the Research, Education and Economics agency budgets will be submitted according to these five outcomes. We are presently developing performance goals, along with performance measures and indicators to measure our progress in achieving our stated goals and outcomes. While at times, fulfilling the GPRA requirements appears to be a daunting task, we are fully committed to implementing this new system of accountability and believe it will help us to better gauge the effectiveness of our programs in providing public benefits. We look forward to sharing our draft strategic plan with the Committee.

Creating A New Vision for the Cooperative Extension Service

Last summer I commissioned a Working Group of individuals from throughout the country to examine and offer ideas for the future of Federal support and direction of the Cooperative Extension Service. The Extension Service is credited with the success in raising this nation's agricultural productivity and it has largely completed this job giving way to private sector consultants and advanced information technologies widely used by farmers to improve profitability. Given the dramatic changes in agriculture and rural demographics since Extension's creation in 1914, it is critical that we review and chart a new course for the extension system. While we are not proposing any new legislative changes, we are pursuing the Working Group's recommendations to make management changes that will clarify and strengthen the accountability of Federal funding for the Cooperative Extension Service.

Implementing the Research Title of the 1996 Farm Bill

We have proposed several innovations that were adopted in the 1996 Farm Bill. These include the consolidation of 3 advisory committees into one, creation of a Strategic Planning Task Force to review agricultural research facilities and the authorization of the Fund for Rural America. We intend to act immediately to implement these provisions.

Because funding for Federally-chartered advisory boards has been cut severely in recent years the Administration proposed the consolidation of the Agricultural Science and Technology Review Board, the Joint Council on Food and Agricultural Sciences, and the National Agricultural Research and Extension Users Advisory Board. The 1996 Farm Bill does just that and creates a single National Research, Education and Economics Advisory Board with 30 members representing a broad array of stakeholders.

The advisory board will be charged with advising USDA on research and education priorities and issues. The advisory board will also play a critical role in providing customer input and oversight in the formulation and implementation of our Strategic Plan.

The Administration also proposed the creation of an independent body to review the capacities of Federally-funded and operated research facilities. Limited resources and shifts in national research priorities require that Federally-operated and funded agricultural research facilities reflect national priorities and be capable of world-class research. As I mentioned earlier, ARS operates 107 Federal research locations throughout the United States and abroad. There are 74 Land Grant universities that have research facilities partially built with Federal support but are fully titled to the state.

The new Research Title calls for the Secretary to establish a Strategic Planning Task Force consisting of 15 members. The purpose of the Task Force is to review all currently operating and planned Federally-supported agricultural research facilities and to develop a 10-year strategic plan for the development, modernization, consolidation, and closure of Federally-supported agricultural research facilities. We applaud the authorization of this provision and intend to establish the Task Force as soon as possible. The work of this Task Force will be critical to providing guidance to ensure the continuance of high-priority and high-quality research in this era of constrained Federal resources.

And finally, the creation of the Fund for Rural America affords us an opportunity to award competitive grants for research, extension and education activities designed to " increase international competitiveness, efficiency, farm profitability; reduce economic and health risks; conserve and enhance natural resources; develop new crops, new crop uses, and new agricultural applications of biotechnology; enhance animal agricultural resources; preserving plant and animal germplasm; increase economic opportunities in farming and rural communities; and expand locally owned value added processing." The Fund for Rural America will give us additional resources for assisting producers in the transition away from reliance on commodity program payments to other tools for managing risk, maintaining profitability and creating new economic opportunities in rural communities.

As we proceed to review our national research and extension policies, there are 3 additional proposals that warrant consideration by this subcommittee. These include elimination of earmarked special grants, a new competitive grants authority for research facilities, and creation of a Fund for Genetic Security.

Strengthening the Federal-State Research and Extension Partnership

In an era of constrained budgets, it is increasingly important to reexamine the Federal-State research and extension partnership to ensure that cooperative efforts are in the national interest leaving the states to support efforts that provide parochial benefits. An area needing better direction to reflect national research priorities is the Cooperative State Research Education and Extension Service (CSREES) Special Grants Program. About half of the FY95 and FY96 appropriations for Special Grants are earmarked. While earmarking of Federal dollars may respond to a need to serve local priorities, a more coordinated approach would provide a coherent national strategy to focus Federal investments. We propose to strengthen the Federal-State partnership for research and extension programs by establishing a competitively awarded matching grant program for applied research. This competitive grant program would require matching funds from states and would replace the current earmarking process of CSREES Special Grants.

Like special grants, funding for the construction of agricultural facilities on university campuses is earmarked. In some cases, these facilities primarily serve crops of a local or regional interest and address problems with minimal national significance. In some instances, Federal funds have been earmarked to fund facilities of minor significance to agriculture.

The Clinton Administration proposes the authorization of a competitive grant program for university research facilities to replace the current earmark process and ensure greater equity and relevance of Federally-supported research facilities at the 1862 and 1890 Land Grant universities. We propose a new authority to replace USDA's current facility construction grant authorities under the Research Facilities Act and P.L. 89-106. While the 1890 universities will be eligible for this new program, we also propose to continue the program of facility grants for 1890 universities under Sec. 1447 of the 1977 National Agriculture Research, Extension and Teaching Policy Act. The program would allow the Secretary to require a matching grant from state institutions. Grants would be awarded to support the five outcomes and identified in our strategic plan in accordance with the findings of the Strategic Planning Task Force on agricultural research facilities.

Maintaining Genetic Security

The long term viability of American agriculture is dependent on public investments designed to collect and protect germplasm. Without such collections and related research programs, the U.S. may not have the ability to respond to future pests, blights and diseases. Current collections are seriously under funded and are, in some cases, actually deteriorating.

In the 1990 Farm Bill, Congress asked ARS for analysis on the status and resource needs of the

National Plant Germplasm System. Since then, requests for additional funding from ARS have largely gone unmet. The critical problem has to do with regeneration of seeds in storage. Regeneration is a necessary means to preserving germplasm over time. Regeneration is conducted to replace low-quality samples with fresh seed. The shortage of funds have prevented the purchase of the necessary equipment and space for regeneration. Important data are not being fully captured from the regeneration sites due to a shortage of personnel. Quarantine research to speed introduction and to eliminate dangerous pathogens utilizing new technologies is also under funded.

To maintain the genetic resources for our future food and fiber production system, USDA proposes the authorization to create a new Fund for Genetic Security. The Secretary would be authorized to request $25 million annually over the next 7 years to support the collection, characterization, preservation and utilization of germplasm to benefit U.S. agriculture.

Conclusion

As we move ahead with this review of our national research and extension policies, we must take into account the limitations of Federal funding, declining support for agricultural research among the new suburban majority, and the demand for greater accountability. These are formidable challenges that require us to respond with new ideas and strong leadership.

We must be prepared to make choices about what activities we continue to do and what we stop doing. We must be able to respond to the questions about what science is in the national interest and what should be left to the states. We must decide what work is in the public interest and what would be better left to the private sector.

As I see it, we really have only two choices. We could stay the course and allow future budget cuts to gradually erode the quality of our public agricultural research system. Or, we can take the initiative today to reexamine and redirect the roles, organizational structures and systems of accountability to retain a viable, high-quality research and education system that provides the public with benefits relevant to their well-being and the national interest. I advocate the latter and I hope that you will give due consideration to the proposals outlined here today. I look forward to working with the Committee as you rewrite our nation's agricultural research and education policy.

Thank you.

COUNCIL OF SCIENTIFIC SOCIETY PRESIDENTS

27 March, 1996

TESTIMONY OF MARTIN APPLE,PhD, EXECUTIVE DIRECTOR OF
THE COUNCIL OF SCIENTIFIC SOCIETY PRESIDENTS

"INVESTMENT IN AGRICULTURAL RESEARCH IS VITAL TO A STRONG FARM ECONOMY"

To: House SubCom'te on Resource Conservation, Research & Forestry.

Chairman Allard, Ranking Member Johnson, Members of the Committee:

The Council of Scientific Society Presidents (CSSP), our national science policy and leadership development center, is an organization of the top elected leadership of scientific professional societies; we include over 100 science disciplines and our member societies have a combined membership of over 1.4 million scientists and science educators. Representing in aggregate the Nation's largest stakeholder of the science research community, we appreciate your consultation with us in your quest to assure that America's world class science research community exercises its unique talents most wisely and effectively.

In their recent letter to the CSSP, Chairman Pat Roberts and Ranking Member de la Garza underscored their belief that investment in agricultural research is vital to a strong farm economy. Those words are very important to all our futures.

We this morning would like to address the improvement of federally sponsored agricultural research because of its continuing importance to the American future. Agricultural research has not only been the key to the American farm economy, but it has been one of the most critical elements for our national economy, providing for example, over $55 billion/ year in exports. Dramatic increases in farm productivity from agricultural research have raised living standards throughout the world, reinforcing the potential for peace and international cooperation. And, as we approach the limits of our impact on the environment, agricultural research holds the key to the quality of the environment in the future.

We will address and discuss this morning only "foundational agricultural research" in this broad agriculture sector. Foundational research is research that serves as the foundation for either expanding the frontiers of our knowledge or as the foundation for future applications.

Foundational agricultural research is funded and conducted by three main entities: federal agencies including extramurally-funded research, state agencies (mainly universities), and the private sector. Your primary interest is the federal responsibility in relation to the 1995 Farm Bill. **We believe the focus for federally-supported agricultural research should be foundational research; research of national scope and impact; research needed by other federal agencies for their missions; research of a scale and magnitude beyond the usual capacity of other research entities; and federal support of the best peer reviewed competitively successful ideas.**

ESTABLISHING NATIONAL GOALS

We suggest that overarching goals for the Nation are the role of the American people, as expressed by their elected leaders, the Congress and Administration.

The federal government must address and ensure for the Nation, in order to achieve our national agricultural goals, a robust long range foundational agricultural research enterprise and its supporting systems: a superb research university system, effective technology/knowledge transfer systems, and an unrivaled scientific workforce.

To fulfill these roles, we encourage you to apply certain fundamental principles to all aspects of foundational agricultural research, from setting priorities through delivering results. These principles, some of which which I will discuss in detail, include:

- Use overall sustainable agriculture as the basis for considering all research for agriculture.

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- Fund research through competitive awards based on merit reviews by qualified experts, where the criteria for evaluation are the quality and prospect of the ideas and their relevance to agricultural missions.
- Use funding systems that are maximally open to all qualified scientists who wish to participate in research for agriculture.
- Set priorities for federally-funded research consistent with the research having major probability of conferring significant, long-run national value.
- Use a "bottom up" strategy in identifying needs and setting research priorities.
- Ensure focus on critically important issues through unified, strategic research and application plans.
- Reestablish by word and deed the "culture of connection" between the doing of research and the extending of research into productive utility.
- Recognize that US research relevant to its agricultural sector is oftentimes also closely relevant to international food security and nutrition.
- Get Congress out of micromanaging research through earmarks and out of funding special grants and other projects initiated through the appropriations process.

FEDERAL ROLES IN RESEARCH

Just as every sector of federal activity is asked to justify its value and deliver the maximum return for every dollar committed to it, traditional programs of agricultural research must be sharply focused on the national interest to warrant taxpayer support. The Agricultural sector is one of the most dramatic examples of the value of federal support of scientific research. Study after study has shown that the economic payoff of federal investment in agricultural research has been immense. The direct (internal) rate of return on each federal dollar invested in agricultural research ranges from 15 to 50 cents per dollar per year, year after year, with an added indirect (secondary) return in the same range. Universally high rates of return like these indicate money well spent— in fact objectively identifying an area of chronic UNDERINVESTMENT. Clearly, in view of this level of return, public monies invested in science research have been among the most valuable public funds spent by government, whatever the objective.

The purposes for agricultural research appropriately embrace the entirety of the agriculture sector: developing a healthy, sufficient, affordable, stable, sustainable, safe food supply; enhance productivity, value and global competitiveness; ensure the quality of the natural resource base for future generations. Such research pursuant to the Farm Bill of 1995 should encompass all of the research that is relevant for the overall agricultural sector. This means it should include all the research relevant to the production and management systems for agriculture, the food production system including nutrition, and the environmental, economic, and rural life factors that relate to the agriculture and food system.

To enhance achievement of these purposes, **the federal government should pursue six inextricably linked major roles:**

- First, to champion the sources and systems of discovery and innovation in all science domains related to agriculture to ensure the US continues world leadership;
- **Second, to strengthen and build the capacity of US agricultural innovation sources, systems and processes as the critical key to sustained national strength and economic growth in a rapidly shifting worldwide economy.**
- Third, to ensure adequate growth and consistent development of support for US long range foundational agricultural research.
- Fourth, to buttress the underpinnings required for a defined, vigorous, dynamic, better US future in all outcomes related to agriculture.
- Fifth, to ensure that the Nation has an evolving, comprehensive, strategic agricultural research plan that addresses the most important issues of the national future.
- Sixth, and very importantly, to fund and conduct research for agriculture that is nationally relevant, addresses major national needs, contributes to a sustainable agricultural economy, has been merit reviewed by experts, and is foundational for furthering innovation and national goals.

SETTING RESEARCH PRIORITIES

We have to recognize that every research proposal is someone's "highest priority." The question is whose priorities should prevail— and ultimately how can we be most objective in making the best choices to advance the national interest.

Clearly the most authoritative expression of the will of the American citizenry and the national interest must come from the Congress and the Administration. It is particularly appropriate and important for the Congressional process to specify the national goals of foundational research. At the same time, it is the nature of science in general, and foundational research in particular, that the quality of research will make all the difference in success or failure. And the selection of the best quality research proposals can only be done by those with the most extensive background in the particular area of science involved. The importance of selecting which individual research proposal should be funded through an objective, merit based competition cannot be escaped. It follows like the night follows day.

It cannot be emphasized too strongly that research for the agricultural sector should be done by those persons with the best ideas and most demonstrated promise--irrespective of their universities or research entities. Federal funding, through the USDA and otherwise, should be available to all qualified scientists on the same merit-based, competitive basis. This is the principle of quality and openness which is the guiding characteristic of the NSF and NIH systems, which most knowledgeable observers believe to be the best of American federally-funded research systems.

Specific research performance agendas are not best set by the federal government. The role of the federal government is to facilitate the processes that experts require to develop them. The expertise and insights of the science community and other key stakeholder communities are the best resources for setting research performance agendas. It is the role of the federal government to recognize and effectively utilize these external resources.

Several emphases should apply to setting agricultural research priorities. These include:

- Set priorities for federally-funded research consistent with conferring significant, long-run national value, e.g., confidence in the quality of the research because it has survived rigorous merit review by qualified scientists and representing federal responsibilities.
- Fund the best ideas and best people as a higher priority than funding institutions.
- Sustain the scientific culture that increases the probability of "quantum leap" research.
- Emphasize research that extends outward from current limits of knowledge into the next frontiers, unknown territories, and uncharted paths.
- Use a "bottom up" strategy in identifying needs and setting priorities; utilize stakeholders and research users in proposing research priorities, and support scientists/researchers in deciding the critically important issues and highest priority research questions.

Commodity groups and food-animal groups define priorities by the most pressing problems, the most lucrative growth markets and most rapidly attained products or improvements on products that provide a competitive edge in those markets. The success of the short-term business priority model depends on the depth and breadth of pre-product foundational research available from which to draw solutions; it cannot succeed alone on a sustained basis unless that research is available. Thus it is clearly very unwise policy to make anyone with a short term perspective the primary driver of federal research priorities. To the extent that advisory boards for agricultural research are heavily based on business interests as advisors, their role needs to be focused on definitions of the challenges and recommendations, not decisions, and on long term (10-15 year) perspectives, not quick fixes. Federally funded agricultural research should complement, but not replace, the research sponsored by commercial enterprises, and should lay the foundations for their continuing success. And, it is indeed wise to ensure U.S. business interests ready access to new knowledge and implications of new discoveries and to ensure a continuing, iterative long term dialog with the research community to increase the probability of effective connection.

Government officials and many research managers see research priorities as territorial definitions and their roles as top-down direction setting. The actual foundational researchers are most successful when ignoring and disrespecting enclosures around their thinking or territorial boundaries in their research, when they are exploring the edges of knowledge. They seek to imagine, to discover and to innovate, to define and solve highly complex problems. They work from the frontiers of what is known into terrain with no prior footprints. They can see what can be done and what areas of knowledge are most open to expansion. Their expertise is more current and their imagination more freely evident than most senior government officials, long removed from the frontiers of world class research.

We thus suggest that a bottom-up decision strategy for priorities will ultimately be more successful, and that the USDA should continue to be committed to utilizing the vast and deep expertise of the Nation's science research community, even more than previously, and certainly as the dominant priority setters for scientific research.

The CSSP would be pleased to assist the Congress and the USDA by developing a list of 50-100 important unanswered research questions as part of informing the planning process of developing each new Farm Bill.

We need to ensure against tedious or over-prescribed priority setting processes that result in excessive delay of progress or make the current lack of agility even worse. The primary impediment to research agility in the USDA is the history of excessive micromanagement of the USDA by Congress, which slows down all decision making and undermines any willingness of senior research directors to take the kinds of prudent risks, some of which will fail, that university-based research directors take all the time.

All research has a common purpose: to find out what we do not yet know, but want to know. Well designed research programs of national scope should connect to the overarching national goals. Setting research priorities can be done very effectively by the science community as in the USDA's National Research Initiative (NRI) and also in the Sustainable Agriculture Research and Education (SARE) program: leading researchers of the scientific community, with input from stakeholders, determine what is possible, most likely to succeed, and of highest priority.

The NIH model sets clear priorities by diversified groups of frontier, leading experts conducting peer-review among competing ideas from across the science community. The NSF model uses the scientific community as the primary priority setter and these priorities evolve as rapidly as the new knowledge requires it to. Scientist-based prioritization models (which can include stakeholders groups,) foster breakthroughs in understanding, win Nobel Prizes and lead to dramatic progress. Persistent success depends on the agility and flexibility in the priority setting process. Both of these models are positively relevant to the agricultural research sector.

The Nation has an excellent, world leading fundamental research capacity in its top doctorate-granting universities and an excellent technology application capacity in its businesses. The middle range of research entities and innovation and connection systems are not as well developed. An **unmet national priority is to study these mid-level connection systems, develop and test many alternative models to improve them and support the models that work best over the long term.**

FUNDING RESEARCH

The relative roles of business or federal funding for this approach should be seen as a spectrum of attributes that indicate primary sponsorship, not an absolute black or white issue. When the research addresses a national problem, has a long-term, has too high a risk or requires too large a size of investment to be likely to achieve a single business sponsor, it becomes a federal role to help the Nation. If the research has a short-term focus, addresses a local or regional problem, is a reasonable business risk, or is of a size likely to achieve a single business sponsor, it is not the federal role to support it. The middle domain between these two is often a fuzzy area. It may be wise to develop joint venture models here rather than force arbitrary demarcations. Thus, it is not an issue of the government providing corporate welfare but of how best to support the national interest.

To achieve the objectives of agricultural research pursuing national goals and on achieving highest quality foundational research a number of steps should be undertaken with care, and evolving to completion over the next 5-10 years, including:

- The fraction of the USDA budget devoted to foundational research should increase steadily in order to achieve the new knowledge needed to ensure world leadership for the Nation and provide the Nation its high rate of return in the Gross Domestic Product.

- Increases in research funding from FY 1997 forward should be directed to university-based, peer-reviewed, investigator-initiated, extramural competitive grants of 3-5 year duration. To the fullest extent possible, ensure research is conducted by the most qualified investigators with best ideas and best records of and prospects for success. This is best achieved through rigorous peer-driven merit review for quality and relevance.

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- All USDA internal research allocations should be shifted during the next 5-10 years into awards extramurally peer-reviewed as competitive grants, with 5 year maximum renewals.

- Minimum standards for retention and promotion of USDA research staff should match those for retention and promotion at the top US research universities.

- Robust knowledge and technology transfer systems for capture of foundational research into commercial value should be established as standard operating policy.

- Apply enough funding to program areas and specific projects and for sufficient duration to make a real difference.

- Get Congress out of micromanaging research through earmarks and out of funding special grants and other initiatives inserted into the appropriations process and related venues.

Too much of the federal agricultural research is not subject to the processes that make for quantum leaps; such processes include: project ideas initiated by frontier research leaders, regular and rigorous peer review, using the power of multiple working hypotheses, a national culture that strongly encourages unique and unusual agricultural research ideas, and accountability for resource use in short increments.

Among the most important breakthroughs in agriculture in the last quarter century were the first genetic engineering processes, all of which grew out of federal funding at Land-Grant universities that met the above criteria, but which, ironically, were not funded by federal agricultural research appropriations (to the Department of Agriculture) until the quantum leap was already taken. **One of the largest disincentives to breakthroughs and quantum leaps is Congressional affection for earmarks:** scientists whose lack of boldness, poor track record of new ideas, and lack of imagination and originality have failed merit review have sources of research funds through direct Congressional intervention that not only circumvent rigorous merit review but also take money out of the hands of those successful in the peer-review process. These earmarks send the message to new scientists year after year that it is not the merit of ideas or accountability for results that makes one successful, but whom you know. The idea of taking risks on new ideas is being replaced by too much caution. Repair of the last decade of Congressionally-established iatrogenic damage will take a decade to recover if we start now; if we do not stop, we will decline even more.

The most important role for Congress and the USDA in ensuring competitiveness as price supports decline may be to stop looking for quick fixes and focus on increased support of imaginative merit-reviewed foundational research. The private sector will need a wide variety of discoveries and improved innovation systems to create higher value. If the past is any guide, many of these discoveries and innovations are the kinds which we might not even be able to imagine for several years. Setting rigid directions, or pushing private sector demands too soon may limit the direction of research imagination and decrease the chances of success.

Extramural funding for agricultural research should, in the main, be allocated through competitive processes using peer-driven merit review processes where the criteria are (i) quality, imagination, innovation, (ii) prospect for success and advancement of knowledge, and (iii) relevance--broadly defined--to the missions of the USDA.

Universities are exceptionally fertile places for conducting research. Indeed, careful observers regularly conclude that the genius of the American research enterprise is the American "research

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university." Land grant universities are, to a large extent, research universities. Research of highest quality is not limited to them, of course. Exceptional research is also done at private and other public universities, and these should have greater access to federal funding for foundational agricultural research than at present.

Land-Grant universities, and their colleges of agriculture and cognate units (schools/colleges of human ecology, forestry and/or natural resources, veterinary medicine and similar units), should be nourished and supported. Their research must also be increasingly subject to the same standards of external peer-driven merit review as characterizes the rest of higher education—and relevancy to the USDA missions, akin to the NIH model of mission relevance.

IMPROVE COORDINATION & ADVICE

Since a variety of effective models exist, lessons should be drawn from them to help optimize coordination. A sensible way to increase coordination—and, importantly, to expedite knowledge and technology transfer from research to commerce—would be to define major national and supra-state needs, focus on those of highest priority (using urgency of issues as a major weighting factor), and proceed to ask the science community to develop some form of evolving, unified, national strategic research and application plans for both major research areas and also for key, urgent contemporary issues. These issues include, e.g. biological and integrated pest management, ecosystem-based sustainable agriculture production systems, new uses and products, optimizing animal production systems, rural economic vitality and vulnerability, and agroforestry systems. From these plans, viewed broadly, and in the context of agroecological zones, effective means of coordination can be established. Transaction costs can be initially higher for this higher level of coordination, and they must be provided to achieve effective coordination.

Coordinating the Research process with the Extension process is important. The Extension Service and Cooperative Extension have been effective in disseminating research and providing major support for the development and advancement of the US agricultural sector and the high rate of return reported by economist's studies of the payoff from agricultural R&D. The characteristics of the "user community" and of the problems, issues, and research results are now very different than previously, created unprecedented new conditions for extension. New models for extending knowledge and technology are rapidly emerging. **An analytical study commissioned in the 1995 Farm Bill on how to most effectively deliver research-based knowledge and technologies would be a productive action.**

Regular cross-communication among all USDA advisory groups, now lacking, will diminish the likelihood of their working at cross purposes. USDA should expand its role in the National Science and Technology Council, the best existing R & D coordination group across all government agencies.

No matter how highly qualified the leaders within USDA may be, they cannot have, and should not be expected to have, all the best experts on all questions all the time. Time-limited ad hoc task forces composed of small numbers of persons, the Nation's most highly qualified by substantial achievements and relevant track records, should be available to the USDA to tackle the Nation's toughest problems and policy issues on a regular basis. Processes are needed that facilitate and enable such groups to be appointed, function, analyze, conclude rapidly, report and disband. By including sunset clauses for every task force, we will prevent the number of advisory groups from growing too large, or the membership from becoming too ingrown, and ensure bringing fresh perspectives to issues. Each task force needs wide latitude in how it operates; prescribing encumbrances on how they do their work will hamper their effectiveness.

I will be pleased, Mr Chairman, to try to answer any questions on improving research.

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REVIEW OF FEDERALLY FUNDED AGRICULTURAL RESEARCH
A Hearing by the Resource Conservation, Research, and Forestry Subcommittee
of the House Agriculture Committee
The Honorable Wayne Allard, Chairman

Testimony presented
March 27, 1996
by
Bill R. Baumgardt
Director of Agricultural Research
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West Lafayette Indiana

"PRIORITY SETTING MECHANISMS: PARTICIPANTS AND PROCESS"

on behalf of
Federation of American Societies of Food Animal Sciences
9650 Rockville Pike
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Mr. Chairman and members of the Subcommittee. I am Bill Baumgardt, Director of Agricultural Research at Purdue University in Indiana. I am here to testify on behalf of the Federation of American Societies of Food Animal Sciences (FASFAS). I thank you for the opportunity to appear before this Subcommittee. We support, as a most critical element, the formation of a Stakeholders Advisory Board (such as the one cited in the conference report) that should be charged to provide goals and priorities for competitive and sustainable systems for agriculture, food and fiber production.

Your committee understands the need to have priorities for research, education and extension associated with competitive and sustainable agriculture and food production. We applaud your efforts in this regard and thank you for the opportunity to present some views and models for priority setting.

I would first like to briefly describe the key elements for effective priority setting in terms of "participants" and then the "process." Finally, I will briefly describe our experience with such a process.

A successful priority setting mechanism for research, extension and education programs must involve three groups as **participants**. First, the users - or what we often term the clientele - must be involved early and often. Second, the **performers** of the research and education activities - the scientists, engineers, veterinarians, etc. - must be involved in several ways that I will describe in a moment. Third, representatives of **society in general** need to be involved because the agenda must be consistent with societal interests. Thus, the participants must include clientele or users, the scientific community, and representatives of society at large. Finally, the product of the process is made available to the Executive and Legislative branches of government for your discussion, judgment, and final action.

Let me next address the **process** for establishing priorities and then carrying out the research and educational programs to achieve the priority goals. It is essential that goals be established, but the responsibility is not complete until funding is provided, participants are selected to receive the awards, and results are achieved, reported, and transferred to users. Details of the process should be tailored to the specific program.

The first part of the process consists of setting broad goals and objectives after the identification and ranking of topics. During the conduct of this phase, a wide net should be cast with direct involvement from a broad segment of users and science participants. Representatives of societal concerns should have the opportunity for input and discussion to help assure that the high priority goals and objectives are in conformity with the needs of society at large. The overall procedure should include interaction and dialogue along with consensus building. The output should identify the things on which consensus was reached and mention the things on which consensus could not be reached.

The second step in the process is to translate the goals into more specific "requests for proposals", known in the grants world as "RFPs." This step is often invisible, but it is crucial that it be done in ways which will link the goals and objectives with response from scientist-performers. In other words, the RFPs must accurately describe the goal in terms so that the scientists can make their best contribution to present needs and future opportunities in the proposals they submit. It should not be done in secret without examination. The process should not be solely focused on problems, but at the same time developed in such a manner as to insure creativity and innovation. Encouragement should be given for scientists to propose creative and novel ideas. RFP development should be an iterative process including review by user representatives.

The third step involves receiving proposals from performers (researchers and educators), evaluating them, and then awarding the grant. The relevance of the proposals to the established goals should be determined by a process which can be made comfortable to both the scientific community and to the users. Those proposals which are determined to be relevant should then be selected largely by a mechanism which will ensure that the best creativity and quality of science are brought to bear on the problem. The goal is to fund those projects which are most likely to yield results that are useful, creative, and reliable.

A fourth step involves reporting back on the results obtained. We in the science community are working to do a better job of this. We need to not only report the scientific results, but also indicate the meaning and impact to the user community and to society in general. We are getting better, but we still have a ways to go! Implicit in the reporting function is the need to transfer the technology and knowledge, and to aid in reducing the new findings to practice.

I would now like to expand a bit on the integration the participants into the process. All of the participant groups - users, the science community, and society - have a role in the identification and ranking of topics. The immediate and longer-term problems facing clientele and users form the primary driver. Scientists with a thorough grasp of the tools and understanding of science can develop effective strategies to seek exciting solutions. It is incumbent on the scientific community to integrate information from relevant disciplines into systems approaches to address the problems and issues. It is incumbent on the user community to allow the creativity of science to be expressed. Advances in science and technology from many disciplines often can be used by the keen minds of agricultural and veterinary researchers to produce exciting new opportunities for agriculture - not only addressing today's problems, but also becoming prepared to address issues that may arise in the future. Such developments provide new technologies which can be deployed to enhance competitiveness, improve quality and safety of food products, and to benefit environmental quality.

I do not believe it is productive to get trapped in an artificial debate on so-called basic versus applied research. What is important is to identify important problems and topics and then dig as deep as necessary in science to arrive at true solutions, not just temporary band-aids. Suffice it to say that it is essential that scientists continue to do research to further understand the fundamental biology (for example) of the plants and animals which are important to the modern agriculture and food system. Without that knowledge we will not be equipped to address emerging problems nor be prepared to quickly address the unforeseen problems of the future. As scientists we should always be willing and able to explain the relevance of what we are doing to the real world of food and agriculture. Our work should be evaluated on the basis of both relevance and on quality of science.

But, I was trying to point out that users, the scientific community, and representatives of the concerns of society all have a role in setting priorities in terms of broad areas. In particular, I wish to identify a model which might be useful. In 1992, FASFAS - the federation of food animal professional societies I am representing here today - co-sponsored a priority setting process which featured a workshop entitled Food Animal Integrated Research (FAIR '95). Over 40 organizations or interests were represented. That process can serve as an excellent model for the Stakeholders Advisory Board. The FAIR '95 model successfully produced a consensus building agenda within the animal agriculture community regarding animal research, education and extension priorities that address key societal issues. It has been widely endorsed by its many constituents.

The key feature of the FAIR '95 process was that it brought together representatives of users, performers (the scientific community), and spokespersons for societal concerns. After a series of plenary presentations as a foundation, the participants were placed in an interactive mode to listen, to learn, and to speak. At the conclusion of the workshop, representatives from the three groups of participants worked with the group recommendations to arrive at the framework for the priorities. FAIR '95 participants formulated research goals for food animal agriculture research and education that will benefit society as a whole. For brevity, the essence of the six goals can be captured as follows:

1.) Identify and quantify societal concerns about food products from animal production systems to enhance communication between consumers and the food industry.
(2) Meet consumer needs in domestic and international markets for competitive and high quality food products from animals.
(3) Develop integrated food animal management systems and animal health systems that support efficient, competitive, and sustainable production of safe and wholesome food consistent with animal and environmental well-being.
(4) Improve the efficiency of resource use to maintain and enhance environmental quality.
(5) Improve food quality in terms of safety, desirability, and nutritional composition.
(6) Develop and apply scientific measures to assess and enhance animal well-being throughout the food production cycle.

The FAIR '95 process went on to present more specific objectives under each goal. I will provide the Subcommittee with copies of the summary documents from the FAIR '95 project.

In conclusion Mr. Chairman, I thank you for this opportunity. I have tried to indicate the necessity of involving both the user and the scientific communities in a process which will blend the needs of users with the opportunities from science in the context of what society expects from its food and fiber system. The process known as FAIR '95 offers a useful model for identification and prioritization of goals and objectives. Our organization would welcome the opportunity to work with your Committee and appropriate agencies in the development of a streamlined and yet more effective priority setting mechanism for federally funded agricultural research, education and extension.

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Testimony Before the U.S. House Committee on Agriculture
Subcommittee on Resource Conservation, Research and Forestry

March 27, 1996

TIME TO READ BETWEEN THE LINES

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The current congressional approach to agricultural research is not working. For years, the House and Senate Agriculture Committees have focused their energies on drafting new statutes rather than overseeing implementation of research programs. While taxpayers seem to accept research as a worthy investment, increasingly they question how dollars are spent and seek details on specific activities undertaken in the name of good science. I am here today to argue that the most useful contribution this Subcommittee could offer our research system is to stop drafting new law and, in its place, use its power to examine the research system under the microscope of public hearings. It is time to read between the lines of existing statutes, to embody them with meaning, and to provide the kind of scrupulous oversight that will ensure taxpayers that their investment is well made. Specifically, I am here to provide a critique of the Farm Bill II process and to suggest four fruitful topics for oversight hearings.

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[1] The Henry A. Wallace Institute for Alternative Agriculture is a nonprofit, tax-exempt, research and education organization. Established in 1983, the Institute encourages and facilitates the adoption of low-cost, resource-conserving, and environmentally-sound farming methods. It works closely with producer groups, public research and education institutions, and government agencies in promoting a sustainable agricultural system.

The Wallace Institute publishes the quarterly *American Journal of Alternative Agriculture*, a monthly newsletter, and occasional papers. Through its Policy Studies Program, it analyzes critical policy issues and options affecting the sustainability of American agriculture. The Wallace Institute maintains a small professional staff and is governed by a grassroots Board of Directors which includes farmers, scientists, educators, and policy analysts. It is supported by memberships, donations, and grants from foundations, corporations, and individuals.

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FARM BILL II ?

I will not dance around the issue of reauthorizing the research title but address it head on. Everyone knows that over the past several weeks the staff and Members of the House and Senate Agriculture Committees debated whether to reauthorize the research title of the 1996 farm bill for either a two or seven year period. In the end, a two year period was chosen and, as I understand it, this hearing is part of a kick-off effort to begin work on a new research title that would go into effect March 1998. I would like to share with you the advice I offered when asked whether to support a two versus seven year title: it matters little. My response may seem cynical and cavalier but let me elaborate with three observations that illuminate the current state of research law.

First, there is so much permanent agricultural research law on the books, that it would be very difficult to prescribe a research activity not already authorized. The partial compilation of research laws produced by the Office of General Council at USDA in 1992 dramatically illustrates this point. Despite its small typeface, this document measures almost two inches deep. Of course, it would be even larger if it contained the research title Congress will soon pass as part of the 1996 farm bill.[2] I have selected three of countless examples to demonstrate the flexibility and abundance of current law.

> *Duplication:* Within the 1990 farm bill alone, research authorities are duplicative. A research program "regarding the production, preparation, processing, handling and storage of agricultural products" is authorized. Nevertheless, two activities logically conducted within this research program -- immunoassay testing and aflatoxin research -- have their own separate and unnecessary authorizations.[3]
>
> *Broad Mandates:* The 1977 farm bill, soon to be fine-tuned by the 1996 farm bill, outlines overwhelmingly comprehensive purposes of research, including authorizing activities to "enhance the long-term viability and competitiveness of the food production and agricultural system of the United States within the global economy."[4]

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[2] The 1992 compilation includes Title XVI (Research) of the Food, Agriculture, Conservation, and Trade Act of 1990 (P.L. 101-624; 104 Stat. 3359); National Agricultural Research, Extension, and Teaching Policy Act of 1977 (Title XIV of P.L. 95-113; 91 Stat. 913); National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1981 (Title XIV of P.L. 97-98; 95 Stat. 1213); National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1985 (Title XIV of P.L. 99-198; 99 Stat. 1354); Competitive, Special, and Facilities Research Grant Act (Section 2 of the Act of August 4, 1965 (7 U.S.C. 450i); Research Facilities Act (7 U.S.C. 390-390j); Act of July 2, 1862 (First Morrill Act) and Act of August 30, 1890 (Second Morrill Act); Title V (Rural Development and Small Farm Research and Education) of the Rural Development Act (7 U.S.C. 341-349); Act of March 2, 1887 (Hatch Act of 1887); Critical Agricultural Materials Act (7 U.S.C. 178 et seq.).

[3] Subtitle E (7 U.S.C. 5871) and Subtitle H, Section 1672, Specialized Research Programs (7 U.S.C. 5925).

[4] Subtitle A (7 U.S.C. 3101).

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> *Carte Blanche Authority:* The 1965 farm bill authorizes the Secretary of Agriculture "to make competitive grants, for periods not to exceed five years, to State agricultural experiment stations, all colleges and universities, other research institutions and organizations, Federal agencies, private organizations or corporations, and individuals, for research to further the programs of the Department of Agriculture."[5]

Clearly no reasonable research objective is excluded under current law. I recognize that my examples may prompt some listeners to consider deleting research authorities in order to curtail the Secretary's very broad authority. But this would be a mistake. It would be impossible for Congress to anticipate adequately specific research needs over a period of years. Discretion is critical for the scientific establishment as it allows USDA to respond to the fluidity of discovery. Even if the Congress committed to dictating the objectives of the USDA research program, it is likely that it would once again end up with broad grants of authority as it is difficult to prescribe research in detail.

Second, most critical research decisions occur during the process of implementation. Members of Congress understand all too well that passing a law is no guarantee that it will result in what Congress intended. The implementation process is lengthy and difficult and not as transparent as the legislative process. Usually the objectives of legislative language are vague because conflicts have been compromised. There is difficulty in translating broad agreement into specific decisions. And there is a multiplicity of decision points, providing great opportunity for blockage and delay.[6] If Congress dictates that 10 percent of all research activities are to be devoted to projects that enhance farm efficiency but never again revisits the topic through oversight activities, it completely cedes authority to administrators to implement the dictate as the bureaucracy -- not Congress -- sees fit.

Third, there is increasing discord between what the House and Senate Agriculture Committees authorize for agricultural research appropriations and what the appropriations committees fund. One of the primary impetuses for this latest research title in the 1996 farm bill was to extend specific authorizations of appropriations which expired at the close of 1995. These extensions were needed, it was argued, for programs such as the Hatch and Smith Lever formula funding programs and the National Research Initiative (NRI). But the truth of the matter is current law is sufficient to continue funding these programs. What the authorization levels do, in theory, is to cap the amount of money any one program can receive. But clearly there is little correlation between budget authority and the amount appropriated. For example, while the NRI is authorized at $500 million annually, it will receive just a little over one fifth that amount in this fiscal year. The Sustainable Agriculture Research and Education program (SARE) is authorized to receive up to $80 million annually but in this fiscal year it will receive less than one tenth that amount. In the area of agricultural research facilities, another disconnect between authorizing and appropriating is seen as facilities are funded which have never been authorized by this Subcommittee and which run counter to your call for a national assessment and reform of agricultural laboratories.

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[5] Act of August 4, 1965 (As amended Through December 31, 1991, P.L. 102-243). Section 2, paragraph (b).

[6] Jeffrey L. Pressman and Aaron Wildavsky, *Implementation* (Berkeley: University of California Press, 1973); and Robert T. Nakamura and Frank Smallwood, *The Politics of Policy Implementation* (New York: St. Martin's Press, 1980).

These observations lead me to conclude that research is a very slippery topic to pin down in law. If this Subcommittee wants to further direct agricultural research, it will need to coordinate its activities with the appropriations committees and conduct regular and extensive oversight activities. Public hearings would allow stakeholders a closer look at what is going on behind the scenes in the research community and provide opportunities for public comment and evaluation. Four topics for such hearings immediately come to mind.

FOUR OVERSIGHT TOPICS

Topic 1: Stakeholder Participation in Research Decisionmaking

Over the past few weeks staff and Members of the House and Senate Agriculture Committees have discussed the meaning and value of stakeholder review of research. Many discussants concluded that good science requires a two step process. Not only do we need scientists to conduct peer review to judge the scientific merit of a particular project, we also need stakeholders from the lay public to evaluate a proposal for its potential contribution to society. Since dwindling public resources limit the number of projects that can be undertaken, stakeholders can help judge what projects are most critical.

There is strong precedent for stakeholder involvement in research decisionmaking -- the National Institutes of Health (NIH) has a two-tiered grant review in order to separate scientific assessment from policy decisions and to provide greater public input. The NIH has long made use of Institute Councils, comprised of lay people as well as scientists, to "take into account national relevance and direction" of research proposals that have already been peer reviewed for scientific merit.[7]

While not called stakeholder review at the time, the issue of lay people involvement in research decisionmaking was a topic to which former Secretary of Agriculture Henry A. Wallace gave considerable thought. Last week Senator John Culver held us spellbound as he delivered a lecture entitled *Seeds and Science: Henry A. Wallace on Agriculture and Human Progress*. It was the first in what will be a series of annual lectures sponsored by the Wallace Institute. I would like to excerpt a portion of Senator Culver's remarks because they underscore so eloquently the balance needed between scientific and lay person review. According to Culver, Wallace did not side with either those who say science must be allowed to work its will regardless of the consequences nor those critics of science who would rather forego knowledge than cope with change.

To scientists he said this:

"The cause of liberty and the cause of true science must always be one and the same.

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[7] National Institutes of Health. 1992. Orientation Handbook for Members of Scientific Review Groups. Public Health Service, U.S. Dept. of Health and Human Services.

> *For science cannot flourish except in an atmosphere of freedom, and freedom cannot survive unless there is an honest facing of facts....Democracy -- and that term includes free science -- must apply itself to meeting the material need of men for work, for income, for goods, for health, for security, and to meeting their spiritual need for dignity, for knowledge, for self-expression, for adventure and for reverence. And it must succeed."*

> In other words, the ends of science must always be mankind. Scientists, no less than the rest of us, must every day ask themselves: What is worthwhile? To the anti-scientists, Wallace said this in 1933:

> *"I have no patience with those who claim that the present surplus of farm products means that we would stop our efforts at improved agricultural efficiency. What we need is not less science in farming, but more science in economics....Science has no doubt made the surplus possible, but science is not responsible for our failure to distribute the fruits of labor equitably."*[8]

Research decisionmaking is not just the domain of scientists. As Wallace understood, the public is vitally interested in agricultural sciences. Efforts to sustain public support for food and agricultural research funding relative to other funding priorities bound to emerge in the 21st century will be greatly aided by involvement of the stakeholding public in decisionmaking processes. As is aptly pointed out in a *Science* article on "The Changing Ecology of United States Science," democratic accountability of science to societal goals is inextricably linked with sustained political support for science.[9] One way of assuring accountability to society is to involve potential recipients of the benefits of research in the process of research decisionmaking. Having a say in the nonscientific aspects of such decisionmaking would give agricultural research stakeholders a new, good reason to actively support continued maintenance of a strong agricultural research system in the face of competing future budget priorities.

RECOMMENDATIONS ON STAKEHOLDER PARTICIPATION

Through oversight hearings, the Subcommittee could aid in the development of practical and timely stakeholder participation by:

(1) ensuring the implementation of Section 804 of the 1996 farm bill, the new research advisory committee, which will, among other duties, provide stakeholder review of activities under the Fund for Rural America,

(2) encouraging USDA to invite farmers and other stakeholders to research fora and to participate in review of all research programs, including the NRI; and

(3) soliciting public input on research operations in order to highlight issues of public

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[8] John C. Culver. 1996. *Seeds and Science: Henry A. Wallace on Agriculture and Human Progress.* Henry A. Wallace Annual Lecture. Henry A. Wallace Institute for Alternative Agriculture, Greenbelt, Maryland.

[9] Radford Dyerly Jr. and Roger A. Pielke Jr., Science, vol. 269 (15 September 1995), pp 1531-1532.

concern and provide feedback to USDA so that research priorities may appropriately evolve.

Topic 2: Social Science Priorities

Wallace challenged scientists to have a greater conscience concerning the implications of their work. Unfortunately, to this day, the social sciences are greatly underfunded and undervalued by USDA and the broader research community. Although there is sufficient authority to fund social sciences, it has not been a priority of the appropriators nor of USDA administrators. Numerous social science projects need to be undertaken as the backlogs of worthy proposals continue to mount. To illustrate this need, I would like to comment on one timely and critical topic -- Economic Research Service (ERS) data collection and evaluation. Rather than cut back on ERS research, as was proposed by the House and Senate Budget Committees last year, we need to reorient it to fill new and critical gaps created by recent Census Bureau decisions.

The basic statistical data needed to understand, analyze, and appropriately support small, family and sustainable farms have become severely compromised. The Census Bureau has announced its intent to change the definition of "farm" for statistical purposes and cease collecting data on the 47 percent of all farms that, in 1992, sold commodities valued at less than $10,000. Neither the USDA nor the Land Grant Colleges of Agriculture have systematically collected data on direct marketing of agricultural products (sales directly to consumers) since the late 1970's. And data collected by USDA for purposes of agricultural outlook, productivity, and farm balance sheets continue to be separate from and largely incompatible with data collected on agriculture's natural resource base and agroenvironmental indicators, despite the close relationship between resource/environmental quality and productivity/farm management practices. Without sufficient and more wisely constructed data series, data-dependent research on sustainable systems will be tightly constrained regardless of the amount of funding available for researchers to pursue relevant and timely questions.

If you think that jokes about the ratio of USDA employees to farmers are bad now (and they are always misleading since more than half of USDA employees deal with food, forestry, or natural resource programs that are not farm based), just wait until the Census redefinition cuts the number of officially designated farms roughly in half next year. Some states (Alaska, New Hampshire, South Carolina, Tennessee, West Virginia) will appear to lose more than two-thirds of their farming community overnight, at least according to official agricultural data. Even in Texas (and a dozen other states), over 60 percent of current farmers would no longer be farmers for statistical purposes. The excluded group includes 60 percent of all Hispanic farm operators, 65 percent of all black farm operators, and 65 percent of all female farm operators in the country. As statistics show the rest of American culture becoming increasingly diversified, agriculture is going to look whiter and more male than ever before.

Aside from the image problem is the more serious problem of losing information on a publicly valued and important component of the U.S. farming sector. The farms with sales under $10,000/year that would be excluded under the Census Bureau's new definition admittedly produce less than 2 percent of the value of all U.S. agricultural goods. Nevertheless, these "microfarms" comprise the vast majority of all farms practicing direct marketing (sales of products directly to individuals for human consumption) and produce about a third of the value of all direct marketed agricultural goods in the nation. Niche marketing and direct marketing, often by small and/or part-time farmers, appear to be increasingly important sources of farm-based income in rural economies of the Northeastern, Southeastern, and Western coastal states. Without data on the farms contributing to this trend, policies, programs, and approaches to capture the value of this segment of farmers can neither be developed nor enhanced.

In addition, "microfarms" operated on 123.5 million acres of agricultural land in 1992. Since those farms' operators are the stewards of a significant chunk of land, county-level data about them is central to developing policies and programs to protect the environment. Finally, microfarms encompass a majority of limited resource farms, part-time farmers, and farms classified as "general," rather than specialized in single commodities -- all of whom may be considered special need constituents of the public agricultural research and education system. Without information on these special need constituents, how can research and education appropriately be targeted toward them?

Data collection at USDA does not adequately support investigation of the performance of sustainable agriculture. Currently, neither the scope nor the detail of the survey data collected by National Agricultural Statistics Service (NASS), and used by the ERS to derive commodity-specific and more general statistics on farm economic performance, is sufficient to conduct comparisons among farms with different types and degrees of sustainable systems employment. Nor is it adequate to learn which features of farm management contribute to the success of various systems. Even more limiting is the fact that the geographic information on the underlying resource base and the environmental proximity of farms that are surveyed for the collection of economic data are rarely collected in conjunction with the cost, returns, and farm practice data. Only if a sufficient amount of appropriately detailed and linked data are collected and adequate resources are devoted to analysis can we gain critically needed knowledge about the failures, successes, and progress of sustainable agriculture systems and about USDA programs supporting sustainable agriculture.

RECOMMENDATIONS ON SOCIAL SCIENCES

Through oversight hearings, the Subcommittee could aid in promoting the social sciences by:

(1) interacting with USDA between farm bills to bring important public policy questions to light;

(2) undertaking investigations on specific issues of concern in the social sciences such as the industrialization of agriculture;

(3) conducting hearings to highlight the best and worst of social science research with the goal of influencing budget actions by administrators and appropriators; and

(4) calling for an expansion in the scope of data collected by USDA and encouraging strategic and coordinated data planning by the Department.

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Topic 1: Sustainable Agriculture

It is no secret that we face an environmental crisis in agriculture. Farmers are under increasing pressure to reduce chemicals and protect natural resources. Yet our research system has been slow to respond to farmers' pleas for help. Sustainable agriculture efforts, such as those conducted by the USDA Sustainable Agriculture Research and Education program (SARE) encompass integrated, multidisciplinary investigations by social and physical scientists to find ways to improve the economic, environmental and social quality of agriculture. But as good as it is, the SARE program alone is not sufficient to address farmers' needs. A recent study of sustainable agriculture, *Planting The Future*, presents a systematic socioeconomic comparison of sustainable and conventional farming in several Midwestern states, complete with farm level data analysis.[10] While the study is the most extensive examination of specific sustainable agriculture systems to date, it concludes with a fundamental question: "Could a shift to more sustainable agricultural practices foster the multiple societal goals of environmental protection, farm-based economic opportunity, and vital rural communities?".

It is time to answer this question. As a recent report from the Wallace Institute challenged: "If modern science can map the human genome, send a satellite to Jupiter, and transfer genes from animals to plants, then certainly we can find a way of increasing crop yields with fewer chemicals and other environmentally threatening inputs and practices."[11] Sustainable agriculture farmers have numerous research questions that should be addressed by the research community. Developing nonchemical alternatives to pesticides is a high priority. The Organic Farming Research Foundation conducts an annual survey of certified organic farmers to find out what research priorities they would like undertaken by the research establishment. I have reproduced the results of the 1994 survey, which includes responses from 39 states, because I find the overwhelming need for weed science stunning. Perhaps this is due to the sizable commitment by our public universities to herbicide research, often at the expense of integrated pest management (IPM) and cultural weed control investigations.

RECOMMENDATIONS ON SUSTAINABLE AGRICULTURE

Through oversight hearings, the Subcommittee could help enrich the discussion of sustainable agriculture by:

(1) showcasing state and local sustainable agriculture initiatives so that policymakers "inside the Beltway" learn from grassroots efforts in this field;

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[10] Elizabeth R. Bird, et. al. *Planting The Future: Developing an Agriculture That Sustains Land and Community* (1995: Iowa State University Press).

[11] Tracy Irwin Hewitt and Katherine R. Smith. September 1995. *Intensive Agriculture and Environmental Quality: Examining the Newest Agricultural Myth.* Report from the Henry A. Wallace Institute for Alternative Agriculture, Greenbelt, Maryland.

(2) convening sustainable agriculture experts from around the country to critique USDA research priorities; and

(3) investigating the state of public support for non-chemical weed science research.

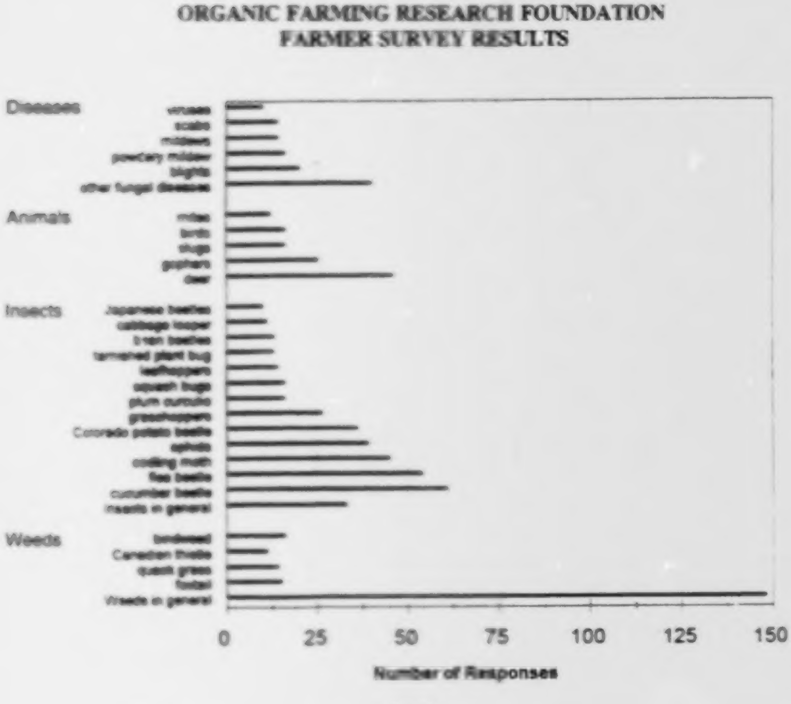

Figure 1
Organic farmers' worst pests by number of responses (farmers surveyed could list up to three).

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Topic 4: Research Accountability

This year the federal government will spend $1.8 billion on agricultural research and education. Few question the importance of this investment. However, the problem is that this money has been dispersed with almost no strings attached. Unfortunately, in some cases our blind faith has been abused. It is time to hold the research establishment accountable -- to ensure that public monies buy public goods and restore public trust.

There are countless examples of university scientists and extension agents receiving payments from industry for "research". Unfortunately, this so-called research sometimes borders on, or is in fact, promotion of specific products. Clearly, unrestricted consulting arrangements can undermine the credibility of the pubic research system. The press has focused on this issue in several states, most recently in North Carolina, Minnesota, Wisconsin, New York, and Massachusetts. While it would be futile to argue that research organizations and their personnel be prohibited from accepting industry dollars, especially in this era of declining budgets, it is reasonable to expect that all federal employees and grant recipients adhere to conflict of interest guidelines. Currently, individual universities and extension systems decide whether to adopt such guidelines; the more enlightened programs have done so. It is time to standardize and require strong guidelines nationwide.

It is also time to require the public research system to disclose the nature of its relationship with industry. Public interest groups now spend limited time and financial resources to FOIA contract arrangements between industry and public universities, extension, and federal laboratories. This information should not be secret. If a chemical company provides 10 percent of an agronomy department budget, it is reasonable for the public, which provides the remaining 90 percent, to know something about the industry project and how it will affect use of public space, equipment, personnel, and overall priorities. Such public disclosure can be designed so that it provides information to watchdog groups without jeopardizing proprietary information.

University researchers are under pressure to supplement dwindling budgets with industry-sponsored projects and pursue joint university-industry intellectual property rights arrangements. No where is this pressure more evident than in the field of weed science. Weed science departments receive a minimal share of university budgets since scientists are expected to raise their own funds from industry sources anxious to "buy" university time to develop herbicide tolerant crops. As a result, weed scientists have few resources to dedicate to non-chemical weed control research. Patent seeking can also lead to unintended conflict of interest problems. For many years I served as the principal staff person dealing with bST in the Senate. When safety questions were raised and the Government Accounting Office (GAO) began its inquiry, it was a struggle to find a single university expert who had not, at one time or another, received industry funding.

RECOMMENDATIONS ON ACCOUNTABILITY

Through oversight hearings, the Subcommittee could ensure greater accountability by:

(1) investigating potential conflict of interest cases;

(2) considering the roles of public and private research, focusing on both appropriate collaborations and divisions of responsibility; and

(3) examining proprietary arrangements between industry and public research entities to evaluate the extent to which such arrangements determine research agendas.

Thank you for the opportunity to testify and present my views on the importance of research oversight.

Agricultural Research Institute (ARI)

Richard A. Herrett

Executive Director

Introduction

Mister Chairman, Members of the Subcommittee, my name is Richard Herrett, I am Executive Director of the Agricultural Research Institute (ARI) and am honored to have this opportunity to speak to you about agricultural research and its importance to the American economy. I shall review some fundamental aspects of agricultural research that might be overlooked in the heat of budgetary considerations and focus especially on priority setting mechanisms.

Origins of ARI

ARI is a non-profit organization with a unique cross section of interests in agricultural research with members from academia, government, industry and public interest groups. ARI evolved from the National Academy of Sciences in the early 1950's when it was recognized that industry was a major component of the research decision making process but because of the structure of the NAS, industry was not permitted to be involved in that process. The need to include industry in discussions involving research programs and priorities while important in the 1950's, is even more essential today because industry spends more on agricultural research than the public sector and faces the common problems of declining resources and pressures to achieve results in a complex world therefore, it is imperative that industry be included in discussions of agricultural research priorities.

> "No man qualifies as a statesman who is entirely ignorant of the problems of wheat. Indeed, one mark of a statesman is the knowledge of how much wheat is takes to feed the people of Athens"
> Socrates...

As one of the most prestigious and oldest organizations in existence today, ARI is committed to becoming the leader in agricultural decision making tackling the many challenges facing agricultural research. ARI's mission is to provide a forum for its diverse members to come together in a neutral setting and benefit from the exchange of information on research, and research policy concerning agriculture, food, natural resources and environmental systems. In these times of growing demands and dwindling resources, the interactions between our various members becomes a mechanism to define needs and educate the general public about agriculture.

Within the past few years, ARI recognized the public sector was also vitally interested in the research agenda that and began to seek the active participation of these interest groups. Today, we have several members from the public sector and are seeking to increase the numbers.

ARI Activities

ARI has facilitated a wide range of scientific workshops including the first joint Forum between EPA and USDA on Integrated Pest Management in 1992. This Forum remains a landmark because of the diverse backgrounds of the over 600 participants. They represented industry, government, academia and the public interest sector.

ARI facilitated the first Biobased Products Expo '92 in St. Louis, Missouri which featured the many technology transfer programs of the Departments of Agriculture, Energy and Commerce. This conference was an integral part of the relationship between Agriculture and Energy that resulted in a Memorandum of Understanding between them last November.

ARI hosted a workshop sponsored in part by USDA on Crop Productions Strategies for the 21st Century. We focused on three different production strategies: Biobased, Biotechnology and Information Technology, three strategies that will have major impact on agricultural production in the next century. As a follow-up, we held a more detailed two-day workshop on Information Technology at the National Agricultural Library in Beltsville. It was an important meeting because it brought the electronic, remote sensing and information gathering industries together with agriculture which included representatives of real world agriculture — farmers.

> In the words of one key player, "ARI is a unique organization dealing in Agriculture, if we didn't have ARI, we'd invent it".

ARI is involved in a range of activities related to research. For example we sponsored a visit of Russian environmental regulatory authorities to EPA where they had an opportunity to discuss face to face some of the common regulatory issues faced by both agencies such as the reregistration of older chemicals. You might be interested to learn the Russians were extremely laudatory of EPA's ability to handle both the reregistration and the registration of new materials in a fashion they considered exemplary. With Russia moving from a centralized system to one in which there are several discreet political entities such as the Ukraine and Moldavia, they were vitally concerned about how EPA handled the complex relationships between a Federal and State authorities.

Another example of an ARI activity was our involvement with the Vavilov Institute in St. Petersburg, Russia. ARI established a trust fund for the Institute as a result of the interest generated by the heart-rendering story of how during World War II, several of the scientists in the Vavilov starved to death without eating the potatoes and grains that became the germ plasm for future plant breeders. As a result of this story, the general public wanted to express their appreciation by donating funds to the Institute. Over $18,000 was collected and sent to the Institute for use in purchasing equipment such as a sheaf thresher and seed sorter.

Our 45th Annual Meeting is scheduled for September 23rd and 24th, 1996 . At that time we will be addressing questions about factors influencing the determination of priorities for agricultural research. This meeting will enable ARI and our members to be active players in defining agricultural research as we approach the critically important 21st century.

ARI: A Champion for Agricultural Research

Why is ARI presenting testimony before this Committee? First, I want to make it clear, ARI not advocating a particular position or endorsing one procedure of financing research versus another. The diversity of our members suggests it would be impossible to reach a single position as ARI. Rather, we are here to "champion" agricultural research by making several rather basic but important points. Our membership has a stake in agricultural research. They are committed to providing safe, abundant food and new technologies to sustain agriculture while at the same time improving the environment.

Background

> **Health requires the understanding, prevention and treatment of disease and the assurance of an adequate, safe, and nutritious food supply. These activities have become more and more dependent on the discoveries of fundamental biology research, often at the molecular level.**
> **President Clinton/**
> **Vice President Gore**

I believe we can all agree that Agriculture has been and continues to be a basic component of the American economic scene. It is one of the largest industries in America at 16% of the Gross Domestic Product (GDP) and growing. It generated over $60 billion dollars in 1995 from the international sales of food and fiber and is expected to grow even more following the implementation of NAFTA and GATT and the reduction of artificial trade barriers. Over time, Agriculture has been the largest single contributor toward a positive balance of trade of any single industry in America; greater than airplanes and chemicals.

The international balance of payments is certainly important to America's economic well-being but Agriculture has an even greater impact on the average family, your constituents. The role of Agricultural research in this aspect can be easily overlooked especially as more and more of the population becomes less and less aware of the risks associated with food production. Lets consider this aspect for a moment: Every American has the opportunity to purchase the safest, healthiest food in the world at the cheapest prices in the world. Americans spend 9% of their disposable income on food and this includes the cost of fast foods. It is perhaps somewhat ironic that the abundant food supply we currently enjoy permits us to take for granted the success of agriculture. The mounting pressures such as diminished acreage available for tillage and the limited availability of adequate water supplies for irrigation cannot be ignored. Nor can we ignore the limits of current technologies such as the intense use of fertilizer and chemicals.

How did this come about? I submit it is a direct consequence of the most efficient research and technology transfer system the world has ever known, systems which if allowed to decompose because of inadequate financial support would ultimately result in disaster, a disaster that would be extremely difficult to justify.

Organization and Impact on Research

In his wisdom as 16th President of the USA, Abe Lincoln signed the Morrill Act which established the Land Grant system, a system that generated basic knowledge and trained those that would ultimately utilize that knowledge. This system is the envy ofthe world, a world that desperately has tried to reproduce the model of efficiency. There are two components to the system: research and extension. Research generates the knowledge while extension transmits that knowledge to the ultimate user, the farmer. While this appears to be based on rather simple relationships, one should not underestimate its complexity. For when functioning properly, it is a two-way street — with the user providing inputs about needs that extension transmits back to research. While this infrastructure required over 100 years to develop, the experience in New Zealand clearly showed it could be rapidly and almost totally destroyed. New Zealand faced similar budget issues that you face today. They decided to privatize the equivalent of their extension system. Initially, they considered the move to be successful as the existing technology in the pipeline moved through to the user with costs being removed from the government. What occurred subsequently however, was totally unpredictable; their research infrastructure began to fail and as a result no new technology was being discovered not because of the lack of capable scientists but because the researchers no longer had the critical linkage with users, a linkage that was essential to provide an awareness of their needs. Ultimately, New Zealand lost their competitive position, a position they are now attempting to reverse.

> "Consider the example of agricultural research over the past century—very possibly the most successful R&D program in the countries history"
> Chubin[7]

Time Required to Implement Discoveries

The time required between a basic discovery and the commercial reality of the discovery is measured in terms of years often times decades. Let me illustrate using examples from agricultural biotechnology.

1995 has been considered a water-shed year for the agricultural biotechnology industry. Over than 40 commercially important crops had been altered and field tested using recombinant DNA methods and several of those genetically modified plants were subsequently granted commercial approval by EPA. These transgenic cultivars demonstrated improved yields due to increased resistance to insect damage, diseases herbicides and physiological stress while other economically important transgenic traits included characteristics related to product quality such as delayed ripening fruit color and seed oil composition.

Specific examples of commercial use include the Ciba Seeds and Mycogen varieties of hybrid corn which contain Bt genes expressing resistance to European Corn Borer; a problem in over 3 million acres of corn that required application of various pesticides. This is expected to virtually reduce if not totally eliminate the application of those pesticides and providing substantial yield increases.

But what about the science which enabled those developments? It depends where in the spectrum of events you wish to begin but if one starts with first example of commercial feasibility when the first snippet of DNA was introduced into a plant, one is back to the early 1970's, if one considers the basic discovery of the structure of DNA you must go back to the late 1960's when Nobel Laureates, Watson and Crick, made their basic discoveries concerning the structure of DNA. At best, it has been at least 25 years since the introduction of DNA into plants and 35 years since the elucidation of DNA. The point of all this is to show that considerable time, perhaps as much as 20 to 30 years depending upon the complexity of the new discovery is required between discovery and commercial implementation.

Why is this important? If demographers are to be believed, the population of world the will double by 2040, and exceed 11 billion people. Thus, any discoveries which might affect food productivity will have to be made within the next 10 years if they are to contribute to the food supply required to feed 11 billion people in 2040.

> "He that will not apply new remedies must expect new ills; for time is the greatest innovator."
> F. Bacon...

Thus far the focus has been on the discovery of new technologies. Once that new technology becomes commercial however, there is an on-going need to maintain that new technology, for example, a new variety of wheat resistant to stem rust requires research to maintain that resistance because the disease organism is under going constant evolutionary change and becoming more virulent. Such efforts sometimes referred to as maintenance research are essential to the continued success of that new variety. The amount of public research expenditures that goes for "maintenance research" reaches 30%. Inadequate maintenance research results in regression of the advances made by the new technology and is important whether one is describing a new variety of rust-resistant wheat or a new production strategy based on boll weevil eradication (see below). This is a consequence of the evolutionary nature of biological systems, and their ability to create new ills.

There is another important attribute of science—science is not static—it must be constantly renewed—it either grows or dies. A former Secretary of Agriculture—a successful businessman having started what today is the world's largest seed company also was a strong proponent of agricultural research. And when facing sever pressures to reduce the scientific efforts of USDA perhaps it said best "Knowledge grows or dies. It cannot live in cold storage. It is perishable and must be constantly renewed. Static science would not be science long, but a mere junk heap of rotting fragments. Our investment in science would vanish if we did not freshen it constantly and keep training an alert scientific personnel".(13)

Relationship of Federal to Private Research

One question raised consistently is that concerning the role of the Federal government in the research arena — should government be involved especially if the effort leads to a profit when industry is the one who is best able to establish such values. I submit there are conditions or situations when it is essential that government plays role, a role that no one else can play and to illustrate this, I will describe the boll weevil eradication program.

In the early 1960's USDA demonstrated the feasibility of areawide boll weevil control and successful pilot trials in 1971 to 1973 indicated the economic feasibility of such a program. Successful eradication was achieved in Virginia, North and South Carolina in the late 1970's and early 1980's.

The program expanded in Georgia, Florida and Alabama in 1987 and today over 99% of the fields are weevil free. In North Carolina, cotton acreage had dropped to below 80 thousand acres at its nadir is now well over 800 thousand acres. In Georgia, the acreage prior to the eradication program ran about 230 thousand acres and is now reaching 1.5 million acres. Perhaps as important as the economic consequences are those related to the insect control practices prior to the eradication of the weevil required 12 to 15 applications per season and was the reason for the low acreage. Following eradication the weevil only 3-5 applications were required as part of a full IPM program that could include Monsanto's transgenic Bt cotton for control of lepidopterous insects.

It doesn't require a rocket scientist to evaluate the positive impact this has had on the economies of NC and GA. I submit to you that there were not sufficient economic incentives to entice industry to conduct the requisite research to develop a program for the elimination of the weevil it could have only been done by government. yet, the beneficiaries are many including the city dweller who can purchase the cotton shirt for a reasonable price.

Funding

The issue of funding is undoubtedly paramount in your minds. it is of course simple to ask for more funding—but there is concern when the dialogue is too narrowly focused on funding levels and is not sufficiently concerned with how to increase the ability of federally supported research to contribute to the welfare of the nation.

> "The overwhelming conclusion is that estimated rates of return to agricultural research have been high, typically well above 20 % per year. Hence, there appears in general to have been a gross underinvestment in agricultural research"
> Alson and Pardey(9)

Agricultural research has been targeted for major reductions even prior to the current drive toward a balanced budget. In FY'96 proposed budget, Agriculture was slated for a 3.6% reduction over the budget of the previous year, the largest reduction of any agency and exceeding the reduction proposed for defense.

USDA research funding for example has been negative since the mid 1970's. Funding for the State Agricultural Experiment Stations is down 40% and private R/D while greater than public funding—is still down 12% in comparison to the public/private long-term rates of growth.

Indeed, fiscal 1995 was the first time Congress reduced funding from virtually all segments of agricultural research—with the next seven years likely to see much more aggressive budget pressures on all agricultural research and development with projections of budget reductions reaching as high as 33%.

These reductions are occurring when the agricultural productivity gains are slowing throughout the world. The slowdown is more pronounced in the United States than elsewhere.(8)

> "As society demands better performance from farmers, it must invest not only in research but also in disseminating its fruits."
> P. Faeth
> World Resources Inst.

Investment in research is a common theme amongst those who are concerned about the agricultural production systems —

World Resources Institute

"Expanded research and technical support for production practices that improve profitability while conserving natural resources is a must" because "environmental improvement is limited by access to resource-conserving technologies. Continuing "As society demands better performance from farmers, it must invest not only in research but also in disseminating its fruits". "Besides expanding extension programs, researchers should work with farmers in developing, testing and dispersing technologies that will make U.S. agriculture more sustainable".[1]

Hudson Institute

Adequate research funding is urgent now for two reasons: 1) it can take years or even decades to develop new research thrusts and bring research findings into practice, and 2) the next half-century is the most critical period — when the wildlife will be saved or lost to food production".

"The second biggest challenge for global agricultural sustainability (after saving the world's remaining wild lands and natural areas from being plowed) for food is to ensure adequate funding for agricultural research at this critical moment of world population growth and rising affluence".[2]

> Agricultural research is the most important sustainability component under humanity's direct control.
> D. Avery—
> Hudson Institute

Wallace Institute for Alternative Agriculture

"We challenge the agricultural research and business communities to investigate the full range of all possible pathways towards the goal of producing adequate food supplies for as many as 10 billion people in the next century. Because no one technological paradigm or class of production systems is likely to prove optional over all locations and circumstances, a failure to pursue all the alternatives and the possible synergies among them is tantamount to irresponsibility".[3]

> We challenge the agricultural research and business communities to investigate the full range of all possible pathways towards the goal of producing adequate food supplies for as many as 10 billion people in the next century.
> K. Smith—
> Wallace Institute

With respect to resources. I don't believe that the case has been made that we have insufficient resources rather, if we have a valuable set of policies, and effective allocation system and a mechanism to obtain agreement from all sides on priorities we will then be in a position to determine what constitutes adequate resources.

America is the recognized leader in agriculture throughout the world. Are we going to allow agriculture to go the way of the steel the electronic, the automotive industries and to become second class producers? How could one justify the loss of global leadership when the amounts one is talking about are so insignificant that they could be lost is in a quick rounding exercise. Although one is ill-advised to focus solely on funding in an examination of agricultural research and indeed we have attempted to demonstrate other aspects, one must evaluate funding in relation to other components to gain the support of the public.(6) For example, how does the research support for agriculture compare to that for other industries?

It is estimated that public funding for agriculture is 0.7% of the GDP revenue generated. The average for all industry is 2.7%—yet as indicated earlier on, agriculture is consistently one of the largest net contributions to a positive balance of payments.

How does agricultural research compare to other countries? As a percentage of the total R/D funding, the United States is the lowest at 1.9% of the developed countries—Japan at 6.5%, Germany at 3.1%, France at 4.6% and the UK at 5.5%.

While those figures are blurred a bit by the compilation of Energy and of Defense engineering development a complication addressed by the National Academy of Sciences Committee on Criteria for Federal Support of Research and Development(8), the United States R/D investment in agriculture is still the smallest in the developed world at 3%. The growth however as noted earlier is flat—to one of major decline—if indeed a 33% reduction is imposed as part of the deficit reduction effort.

I'd like to make one final point — agriculture has been in a state of declining productivity for at least the past two and possibly three decades. This situation is not unique to agriculture it is something that industry has witnessed rather dramatically. An argument has been put forth that suggests we should not allow budget cuts that reduce productivity. I would submit this holds true especially for agriculture perhaps even more so than in other components of industry because food plays such a fundamental role in our lives — there is no other indispensable component besides food; we can live without a lot of things such as tv and cars but food — without it we're dead.

> "The extraordinary productivity of U.S. Agriculture is crucial to our world economic leadership"
> FASEB(9)

Summary

I've described the complexity of agricultural research from an organizational and technological perspective. It is predicated on an infrastructure that required over 100 years to develop and has a demonstrated track record of moving technology from a laboratory curiosity to a commercial product, an efficiency with returns on investment exceeding an annualized return of 35%(12), year in and year out. While it is certainly possible to argue there are areas in the system which can be improved for example, there is considerable need for improving the inputs and methods used to establish research priorities, with clear needs for improved communications between industry and government. There are four critical outcomes that dictate a need to support a strong research agenda —

●Minimize food costs to 98% of those Americans that purchase food but don't participate in the production process.

●Derive maximum return on investment to generate future revenues.

●Enhance global competitiveness.

●Insure environmental well-being on a sustainable basis.

America's world leadership in food production and domestic food safety and security can only be maintained by a continuing commitment to agricultural research and development.

DR. J. GREGORY ZEIKUS
PRESIDENT & CEO
MBI INTERNATIONAL

MANUFACTURING AGRICULTURALLY-BASED INDUSTRIAL PRODUCTS FOR WORLD MARKETS

Chairman Allard, Mr. Johnson and members of the U.S. House Subcommittee on Resource Conservation, Research, and Forestry: My name is Greg Zeikus and I am President of MBI International. Thank you for this opportunity to discuss the economic and strategic impact of manufacturing agriculturally-based industrial products for the marketplace.

My remarks cover three areas:

- the importance of continuing to fund research and technology development to manufacture industrial products from agricultural resources;
- effective mechanisms for disseminating these products to the manufacturer and customer; and
- what the federal government can continue to do to facilitate this process.

MBI International is based in Lansing, Michigan. MBI's mission is to demonstrate the technical and economic feasibility of technologies to manufacture industrial products from agricultural crops. We, then, transfer these demonstrated technologies to industry and new start-up companies for commercial production. The technologies developed compete economically in today's markets.

Agriculturally-based industrial products include chemicals, fertilizers, pesticides, plastics, food and feed ingredients, fuels, polymers, solvents, detergents and pharmaceutical ingredients produced from U.S. agricultural resources rather than imported petroleum. During the past 10 years, world sales of products such as fuels, high fructose syrups and specialty chemicals made from agricultural resources increased 67% with sales reaching $14 billion. It is projected that when oxygenated chemicals and biomaterials are added to the list of agri-based products, markets will approach $60 billion by 2020. An agri-based industrial manufacturing industry with new markets for agricultural producers and much higher value products for export Is being created.

Continue Funding for Research and Technology Development

There are three crucial reasons the United States should continue to fund research to use agricultural resources as the raw materials for industrial products - national security, rural economy and environmental quality. If we move from a petroleum-based manufacturing economy to a agricultural-based manufacturing economy, we will enhance these three vital aspects of American life and independence.

First, the U.S. must reduce its dependence on foreign petroleum from unreliable and sometimes unfriendly countries. Over 50% of the petroleum used in this country is imported. Imports of foreign petroleum are the major contributor to the U.S. trade deficit. A disruption in the supply of oil could seriously hamper our ability to respond to a state of emergency. Increases in the price of oil lead directly to increases in inflation. Until the early 1970s, oil prices had been stable and so had U.S. inflation. Oil prices quadrupled during the OPEC embargo and inflation exploded, going from 1-2% per year to over 12%.

The U.S. continues to expand the trade deficit by importing petroleum for use as industrial product feedstocks while exporting relatively low-value commodity crops. We must use our agricultural resources to produce higher-value products for export. The U.S. is much more proficient at producing agricultural feedstocks than producing petroleum. For example - the U.S. receives $10 million for the export of 200 million pounds of corn (at $.05 per pound). If this corn was used to produce chemical intermediates or plastics, we could export products valued at $1.00 per pound and increase exports to $200 million - a 2000% increase in the value of our exports. Imagine the impact on the trade deficit and the rural economy if only half of our commodity crop exports were converted to exports of higher-value products.

Second, one of our country's major strengths lies in rural America's ability to produce agricultural feedstocks for foods and feeds. We must maintain and capitalize on this strength to produce agricultural feedstocks for industrial products as well. The Farm Bill that this Subcommittee has laboriously taken to conference will eliminate farm price supports over a period of time as part of the effort to balance the federal budget. To support the rural community, agricultural production and rural manufacturing jobs must increase. American farmers must have their crops used as raw materials for industrial products to increase demand for production. This will lead to creation of new businesses, investment opportunities and manufacturing jobs in rural America.

Third, there continues to be nationwide demand for less polluting and fossil energy consuming technologies. Industrial products produced from agricultural resources are environmentally benign, both in their creation and their use. We will have cleaner processes, safer industrial products and a stable, domestic-based industrial manufacturing economy.

Agriculture must recapture markets lost at the end of World War I when the need for synthetic rubber opened the market for the petrochemical industry. Today, synthetic rubber can be made from corn and other agricultural feedstocks. I'm sure there are those of you who say this sounds good, but can products made from agricultural resources really compete with petroleum-based products. Petroleum at $17.50 per barrel has a feedstock cost of $.05/pound. Corn at $2.50/bushel has the same feedstock cost of $.05/pound. Both oil and corn have equivalent costs as a carbon feedstock for industrial manufacturing. It is our challenge - and believe me, it is a major challenge - to ensure that industrial products developed using agricultural feedstocks are competitive with the petrochemical industry.

Effective Mechanisms for Disseminating Agri-based Industrial Products

There are three phases to the creation of new industries and manufacturing sectors:

- Discovery of new ideas and inventions - generally at universities or federal laboratories;
- Demonstration of the technical and economic feasibility of these new ideas and inventions; and

- Transfer of demonstrated inventions to start new companies or to enhance existing industrial segments. Agri-based industrial products represent a new industry, therefore, there are few opportunities to license demonstrated inventions to existing industrial segments. Most technologies will be the basis for new company creation.

The federal government funds universities and federal laboratories where numerous agri-based industrial product technologies are discovered. These discoveries can fill the agri-based industrial manufacturing pipeline. Unfortunately, many of these inventions "sit on the shelf" until technical and economic evaluations are performed, development is complete and scale-up and demonstration have been achieved.

Therefore, federal government must provide funding to allow the discoveries produced by our great universities and laboratories to leap from the shelf into new small businesses. MBI International and a few other organizations throughout the country actually do the evaluations, development, scale-up and demonstration work. Our goals are to evaluate agri-based industrial technologies from throughout the U.S., in-license promising technologies, complete technology development and scale-up, achieve economic validation and introduce new technologies to the marketplace through new company creations or licenses to existing companies. This is how MBI helped several federally-funded discoveries reached the marketplace and consumers.

MBI's work has resulted in the creation of 5 new companies and 3 global joint ventures, all operating in the U.S. with activities in Idaho, Nebraska, Minnesota and Michigan. All products manufactured are derived from agricultural resources. Dissemination of the information produced with federally funded research or "commercialization of agri-based industrial technologies" was accelerated through the technology transfer and development expertise of MBI. Several new industrial products are now in the marketplace including:

- chemical intermediates for the pharmaceutical and agrichemical industry with a projected annual market of $2.4 billion by 2000;
- natural food flavors and ingredients with a projected market of $400 million annually,
- biodegradable plastics - molded products like plastic cutlery, films for agricultural mulch and leaf bags and biodegradable adhesives - market potential of $2 billion annually, and,
- plant growth promoters that decrease the need for nitrogen and increase crop productivity whose market can range from $70 million to $7 billion annually dependent upon crop applications.

What Can the Federal Government Continue to Do

First, government agriculture leaders must help change the U.S. vision of agriculture. During the past 20 years, the number of farms, farmers and rural jobs have declined. As price supports decrease, more jobs will be lost unless new markets for agricultural crops increase substantially. Agricultural resources must be used for foods and feeds and as feedstocks for industrial products manufactured In rural America.

Second, we must exploit the federally funded discoveries in our universities and federal laboratories. We strongly urge that funding be maintained for development and demonstration of new agri-based product technologies. Significant risks lie between technologies "on the shelf"

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and "fully developed and demonstrated technologies". Until the technical and economic feasibility of these technologies is demonstrated, they will not be introduced to new or existing businesses. We must continue funding the "vacuum" between discovery research and new company creation. MBI International would not have been able to develop, demonstrate and introduce the new agri-based technologies we found at universities and labs that resulted in 8 new companies without federal funding.

Federal funding is only one part of the equation. Matching funds from states, agricultural organizations and industry have been and will continue to be used to develop technology and disseminate it to customers. We work hard to ensure there are numerous stakeholders in the business of creating an agri-based industrial products manufacturing industry.

We are excited about this new vision for agriculture and the creation of a new agri-based industrial manufacturing sector. This new sector will create new manufacturing opportunities in rural areas, reduce the trade deficit and provide farmers with growing markets for their crops. We must continue funding discovery research and the "vacuum" where technologies are demonstrated and introduced to industry to make this happen.

Thank you, Chairman Allard and members of your Subcommittee, for the opportunity to meet with you today.

DR. RONALD MARLER, DEAN

KANSAS STATE UNVERISTY
COLLEGE OF VETERINARY MEDICINE

Mr. Chairman, thank you for the opportunity to present testimony to this subcommittee as you begin to examine possible changes to the agriculture research component of the Farm Bill. I am Dr. Ronald Marler, Dean of Kansas State University's College of Veterinary Medicine. I am testifying today on behalf of the Association of American Veterinary Medical Colleges (AAVMC). AAVMC's mission is to coordinate the affairs of the 27 US Veterinary Medical Colleges, Departments of Veterinary Science, Departments of Comparative Medicine and animal medical centers and to foster their teaching, research and service missions nationally and internationally. Addressing the interests of producers and consumers of food and fiber, the interests of animal owners, and pet owners, AAVMC's principal interest is improving the quality of human and animal life. AAVMC continues to address societal concerns about food safety; advance veterinary medical education; improve animal and human health and well-being; strengthen biomedical research, and enhance environmental quality.

Animal health research must be supported: Summary of major points

•Animals and related industries contribute in excess of $100 billion to the American economy.

•Healthy animals produce safe food, a better environment, and improve animal and human well being.

•A solid animal health research base is vital to the health and well-being of both animals and people in our society and the industries that revolve around these animals. It is essential to ensure the continued safety and wholesomeness of America's food supply.

•The Department of Agriculture needs to increase its spending on competitive research programs which target animal health and disease, and rural health problems. Leading to the development of new veterinary medical research programs in addition to the existing research base.

•One advisory board should be established to allow for input into the federal agriculture research agenda rather than from several special interest boards.

Research should focus on food safety

Foods derived from animals are essential to the health and well-being of American citizens. While the U.S. produces the most abundant and safest food supply in the world and food-borne diseases are associated with only a very small fraction of the total food consumed, the Food Safety and Inspection Service estimates there are as many as 7 million cases of food borne illnesses yearly, with 7,000 deaths and that these illnesses result in $3.7 billion in health care costs and job related absenteeism annually. Without effective intervention, these statistics will escalate in the future as the overall U.S. population includes more people who are aged, are immunosuppressed, or have reduced resistance to disease for other reasons.

The food production systems have become more complex as our society has become more urbanized, with modifications in processing, distribution, retailing, preparation, and final handling by the consumer. Contamination of the food can occur at any step of this continuum and research is needed to develop intervention strategies at each step. While veterinary medicine historically has been an important component of the post-harvest phase of food safety through the USDA's food safety and public health responsibilities, it is also vital to producers to address the pre-harvest or production phase of food safety on farms. On-farm animal disease control and other food safety programs need to be developed that maintain healthy animals, and that will lead to production of high quality foods that enter the food chain free of microbial or chemical contaminants. Ultimately, on-farm Hazard Analysis Critical Control Point (HACCP) programs need to be developed for specific microbes and chemicals. Under the leadership of the nation's specifically trained animal health professions, these programs must be established through involvement of interdisciplinary research teams that integrate economic factors, animal well-being considerations and environmental issues.

Unfortunately, little is known about the conditions that foster the survival and distribution of microbial contaminants. This knowledge will be essential to the reduction and possible elimination of these contaminants from our food animals and thereby from the U.S. food supply. Research must be done to develop effective and comprehensive monitoring and surveillance systems for the effective control of food-borne diseases. In addition, research must be utilized to develop rapid, simple, sensitive and specific diagnostic/detection techniques for identifying food borne hazards.

Research should focus on the enhancement of the global market

With the passage of the North America Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT), the opportunity to expand the export of animal food products has increased, but such expansion can occur only if the animals producing this food are healthy. Veterinary medical research will optimize animal production systems to yield abundant, safe, high quality, wholesome, and nutritious food that will successfully compete in global markets, and provide scientific information for control or elimination of animal diseases that may become trade barriers.

Whether one speaks of livestock, poultry, or aquatic animal systems, optimal management of growth, reproduction, and development must be cost-effective and humane. Monitoring and improving animal health, and computer-based support systems are an integral part of the system. In addition, assessment and control of the risks of exposure to pesticides, hazardous chemicals, or pathogenic microbes will allow producers to be proactive in maintaining the safety and quality of animal products, and enhancing the health of rural Americans.

Targeted research funding is also critical for success. This support is important for the development of new technology and products, their testing in the field, and their transfer to producers. Funding is also needed for emergency situations where new diseases threaten the safety of food, the economy of production, or the export of product. In summary, veterinary medical research is needed to facilitate, expedite or promote approval of vaccines and drugs for food animals and to assist in the technology transfer needed to apply new technologies to the animal production setting.

USDA must spend more on animal health research

Clinical veterinary medicine derives its strength from a solid base in animal health and disease research. Livestock producers most often rank animal disease as their primary problem in limiting the economic return on their labor and investment. Research leading to more effective control of zoonotic diseases in all species of animals plays a major role in protection of both animal health and protection of human health. (We will add a Koop statement here)

Over the last two decades, there has been a resurgence in the occurrence of infectious diseases

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in both animals and people. This has occurred in spite of the impression that infectious diseases were largely controlled and no longer an issue of concern. The ability of microbial and viral agents to establish new niches or undergo genetic mutations may lead to the appearance of new diseases. Similarly, new food processing techniques may inadvertently create conditions wherein pathogens proliferate. In addition, there is increasing evidence that antibiotic drug resistance has reduced the effectiveness of animal and human disease therapy. In these cases, concern is being raised about the source of the resistance factors, and whether antibiotic use to prevent diseases in animals may increase the appearance of antibiotic resistance in human pathogens.

The pace at which new infectious diseases emerge promises to increase in light of the passage of World Trade Agreements. The emphasis on globalization of trade will increase shipments of commercial items into the United States. Some of these items may contain new infectious agents or the vectors of infectious agents. The appearance of new or re-emerging diseases can have an economically devastating effect on food security, leading to non-tariff trade barriers. New or re-emerging diseases can also place the human population at risk if the infectious agent is harmful to humans.

Veterinary medical institutions are particularly well qualified to address new and re-emerging diseases because of their experience in diagnosis, epidemiology, pathology, microbiology, toxicology, and disease control of many species. Targeted research funding is critically needed to identify these existing and potential disease threats.

Research should focus on the well-being of animals

There is a growing dichotomy between present agricultural practices and public images of farm life. This is most apparent in issues related to intensive animal production. A great majority of livestock and poultry producers traditionally have taken a responsible approach to ensuring the well-being of their animals. Non-scientifically based criticisms of modern food animal production practices have raised public concerns about the humaneness of these practices. A coordinated effort involving veterinarians, food animal producers and industries, the scientific community, governmental agencies, and consumers of animal products is needed to successfully resolve public concerns related to well-being and the humane care and use of farm animal species. Producers face major pressures to increase production efficiency in order to remain competitive in the face of low prices, changing consumer demands, and heavily subsidized international markets. Establishing guidelines for the care of animals in the production environment is especially challenging because economic feasibility is essential to survival of the production unit.

Our scientific knowledge base related to food animal well-being must be strengthened. Veterinary medical researchers in association with animal scientists are well trained to contribute to studies designed to provide the quantitative data needed to realistically assess recommendations for changes in integrated production management systems which include health monitoring and disease prevention. Opportunities for grant support for animal well-being research are very limited and need to be increased.

Research should focus on animals in the environment

Evolution of our complex society has been accompanied by a generation of a variety of chemicals from industrial, agricultural, pharmaceutical, energy-related, household, and other sources which are then discharged into the environment. Many are directly toxic to animals, plants, and people. Others produce subtle health effects including reduced fertility, growth, productivity, and resistance to infectious diseases. Equally important is the multitude of naturally occurring fungal and plant toxins that may be present in animal feeds. The potential for various chemical and microbial hazards in recycled wastes that affect domestic animals and people remains a constant concern. Veterinary medicine is often the first to be called upon when environmental disasters involving free-ranging wildlife, marine or aquatic species occur. Veterinary medical diagnostic laboratories are called upon to identify the cause of deaths and evaluate the potential threat of these disasters to animals as well as people.

Environmental toxicology and epidemiology investigations are needed to assess the health hazards of environmental pollutants and establish cause and effect relationships. Many diseases of domestic animals also threaten wildlife, such as canine distemper in a variety of species; brucellosis and bovine tuberculosis also are of concern. Infectious agents in free ranging wildlife such as Lyme disease (Borrelia burgdorfei) and Ehrlichia spp. in which deer may serve as the reservoir are associated with diseases in domestic animals and humans. There is little or no data available to assess the impact of many of these infectious agents or toxic products in free ranging wildlife. Veterinary medical research is needed to address these and other issues of free-ranging wildlife, marine and aquatic species that are not covered by traditional animal health funding.

Research should focus on the animal health delivery system which applies the above five items of (1) Food Safety, (2) Enhancement of the Global Market, (3) Animal Health Research, (4) Well Being of Animals and (5) Animals in the Environment.

Section 507 "Fund for Rural America" of S. 1541 establishes a mechanism for improving the quality of life and economic well being of rural America. A primary participant in the coordinated improvement of both human and animal well being in rural America is the veterinary practitioner. The health of animals in the environment and in animal agriculture directly affects the economic well being of rural communities and the health of all people in our society. To the degree that animals remain healthy food safety is improved, environmental issues are integrated, profitability of animal agriculture is increased and global markets of American agriculture are expanded. All of this depends on expanded animal health research and improved incorporation of that research into the animal health care delivery system in rural America.

Funding mechanisms for critical research needs

Currently, the research needs that I have outlined could be addressed through the National Research Initiative (NRI), which was established in the 1990 Farm Bill. However, the intended funding level for the program has never been reached, and funding has even been cut over the last two fiscal years. This has caused the Department to be forced to prioritize research projects, which have resulted in a reduced funding level for veterinary medicine. In addition, the lack of funds has left a gap between research results, and the technology transfer of the results.

In addition to the NRI, veterinary medicine is able to conduct limited research with the Animal Health Formula Funds (1433). However, in FY 1996, Congress cut the funds appropriation disproportionately greater than other base programs, and section 1434 of the 1990 farm bill, which was established for research on national or regional problems has never received any appropriated funds.

We urge the committee's continued support for such programs, and the veterinary medical community will continue to seek funding support as well. In addition, we ask that the committee consider the establishment of an additional research program that has been referred to as either the Fund for Rural America or the Agricultural Competitiveness Initiative. Such a program would allow U.S. agriculture to research issues of food safety, of enhancing the global market, improving animal health and well-being, and enhancing the environment.

Stakeholders Advisory Board

AAVMC strongly supports the establishment of one advisory board which allows the stakeholders to have input into the federal agricultural research agenda. The Board should reflect the desires of consumers, the needs of producers as an attempt to provide products to meet societal needs, and the judgement of professionals who know what science and technology can provide in this joint effort. We would urge that the board collect such information in a similar manner that was used in FAIR' 95. During this conference six goals for animal agriculture were identified through a first time collaboration of producers, scientists, veterinarians, processors, and advocacy groups. Such a process has been and could be very vital to the Department in setting research priorities that will fulfill societal interests and needs.

I appreciate the opportunity to review for the Committee the critical issues that face academic veterinary medicine today. On behalf of the AAVMC, I would like to thank you for your continued commitment to the betterment of the U.S. agriculture industry.

Testimony
Before the House Agriculture Subcommittee
on Resource Conservation, Research, and Forestry
on Federally-Funded Agricultural Research,
Education, and Extension Programs
Barbara S. Stowe, Dean
College of Human Ecology, Kansas State University
and Assistant Director, Kansas Agricultural Experiment Station
for
the Board on Human Sciences,
Commission on Food, Environment, and Renewable Resources,
National Association of State Universities and Land-Grant Colleges

Mr. Chairman and Members of the Subcommittee:

My name is Barbara S. Stowe. I am Dean of the College of Human Ecology and Assistant Director of the Agricultural Experiment Station at Kansas State University. This testimony is in behalf of the Board on Human Sciences of the National Association of State Universities and Land-Grant Colleges (NASULGC). The Board on Human Sciences is comprised of administrators with responsibility for research and extension which addresses vital issues of family and community, human nutrition as it impacts health, food safety, conversion of agricultural products into food and nonfood uses, human development throughout the lifespan and related issues. Its members administer extension programs which translate research into useful solutions to human problems and oversee higher education programs which are teaching the next generation of researchers and extension leaders. As a constituent part of the land-grant university system, human science research, education, and extension agendas are driven by the needs and interests of the people of the member states. This implies appropriate mechanisms are in place for determining what these needs and interests are, and how to translate them into curricula, research, and extension programs.

Changing Needs of Rural America

Citizen Participation in Priority Setting

The land-grant university is linked to the people through an educational infrastructure which is the Cooperative Extension Service. There is an extension presence in every county which not only delivers research-based information to the citizens, but which delivers to the university the needs and interests of the people being served. Extension programming is also guided at the local level by citizen advisory boards which are representative of the population. Periodically, land-grant universities conduct scientific surveys, public forums and focus groups to identify issues and priorities for strategic planning purposes and program redirection. It is through these surveys and listening sessions that we know that the issues are changing.

Consistently over the past five years, across the United States, issues identified as top priorities include:

- maintaining viable communities
- improving the local economy
- maintaining strong, healthy families in a safe environment
- assuring health maintenance and an available, affordable health care system

- balancing agricultural productivity and protecting the environment

What you did not hear in this priority list are issues of agricultural production, technology, or marketing. There has been a significant amount of research conducted on agricultural production issues which has greatly benefitted the U.S. society and the economy. So, it is not because these issues are not of importance to rural America, but that our research, extension, and education systems have been attending to these issues better than some others. This may be due in part because families and communities generally do not have as strong an organized advocacy as does production agriculture.

This Congress has been at the forefront of concern for identifying state and local needs and designing appropriate mechanisms to support those needs. Those responsible for research and extension programs in the land-grant university system share Congress' concerns. Through numerous surveys and other advisory mechanisms, we find that changing rural America is signaling a need for research and education in some different areas.

Supporting Agriculture

Issues Which Support Agricultural Concerns

It is argued that issues related to rural families, health, nutrition, community viability, etc. are not strictly agricultural issues. First, let it be noted, when advisory boards and community groups are asked to identify priority issues, farmers, ranchers, producers and processors of agricultural products are represented on those advisory boards and in the survey samples. Farmers, ranchers, and others who constitute the total agricultural enterprise live and rear families in rural America. They are concerned about economic viability and quality of life for their families as well as markets for their products, conservation of the soil, and availability of a water supply. They understand that all these factors are interrelated.

For the next few minutes, I will focus on some specific areas for research and extension programming which have been identified as changing needs and which, if supported, would positively impact the whole agricultural enterprise.

- **Nutrition, Food Science/Safety Research and Education** - a major shift in health care is toward health maintenance and disease prevention which requires a much better information system on diet in relation to health. The land-grant university system in partnership with the USDA are in the best position to relate human nutrition to the quality of the food supply. Food scientists work in collaboration with nutrition researchers in developing food products which meet nutritional needs and the interests of the consumer. Other food scientists use biotechnology to develop and modify agricultural raw materials into marketable, nutritious foods. It is a linked system from production to consumption.

  Higher education is educating dieticians to become active members of the community health maintenance organizations. Better data on nutrition and its relation to health is a potent element in reducing health care costs. The availability of quality, low-cost health care is a major challenge for rural communities, hence health maintenance is critically important.

  ### The Federal Role

  - There is a significant federal role for nutrition research and education. Science which is common across the nation and the metabolism of nutrients in the body to ensure human health is common regardless of where people live. Therefore, developing federal guidelines for nutrition is cost effective.

  - State land-grant universities are similar in structure but vary in emphasis and specific areas of expertise. The federal partner, in collaboration with the land-grant universities can access research expertise to solve specific national problems.

    For example, if it is a national priority to determine the impact of nutrition on the cognitive development of children, CSREES in collaboration with human sciences colleges in land-grant universities can develop the RFPs which will access the best science to answer the question both from the perspective of nutrition and of child development. Further, the scientific findings are then linked to an educational system which will disseminate the findings.

- **Family and Community Issues** - fewer and larger farms have changed the community structure of rural America. Rural families want to rear children in a positive, small community atmosphere, but are finding it difficult with limited educational and other community services, limited living-wage jobs which lead to dual career households, and often the necessity to care for aging family members as well as young children. The extension service can address issues of family resource management, balancing work and family, and leadership education to help communities creatively deal with available health care, education, and other needed services which can reduce pressures on family life.

  One size does not fit all. Research is needed to model successful small community development and organization. Extrapolation of information from metropolitan to small towns may lead to poor solutions. Strong families are the source of an available, qualified workforce, hence, the agricultural enterprise must make family issues a part of the agenda.

  The circumstances of rural family life have changed but not the basic rural values of a strong family which nurtures the growth and development of responsible youth and adults. For example, when both parents work off the farm, often at some distance, "after school" time may leave children alone and unsupervised. Successful models of school, business, community and family interaction must be developed to allow families to nurture their children to productive adulthood while adjusting their own lifestyles to changed circumstances. Human sciences colleges in the land-grant university system are positioned to conduct research to address this and similar problems.

- **Value-Added** - People in the United States and abroad want food products which are nutritious and safe, but which require little preparation time. Researchers, properly supported, can develop an array of food and nonfood products from agricultural commodities. Extension specialists can work with small producers not only to develop marketable products, but to assist clientele in developing marketing and distribution strategies. Conversion of agricultural commodities into marketable products can provide new industries in rural America and higher education can help retrain the workforce for the new jobs. The value-added industries should employ leading-edge technologies which not only convert agricultural commodities into innovative and marketable products, but require a high-quality rural workforce, which earns competitive salaries and benefits.

  Increasing markets, nationally and internationally, for agricultural products will require a far better understanding of consumer interests and requirements. People in many cultures now want ready-to-serve food products which are safe and nutritious, but marketable products are likely to be culture specific, thus consumer assessments must be an element of successful product design. Sensory analysis units in departments of Foods and Nutrition are in a position to provide this marketing data.

- **Telecommunications** - Electronic communication is providing a powerful new tool for linking disperse populations with the land-grant university, medical services, and many others. Researchers, extension staff, and faculty need support in determining how most effectively to serve clientele with this new media. Everything that is on the "web" is not research-based, quality information in useable form. Land-grant university researchers and extension educators can help people use the media to their advantage.

These are examples of areas not generally well supported in USDA budgets, but are vital to the changing needs of rural America. We strongly urge that the House Agriculture Committee authorize in the 1996 Farm Bill the means to support these and other priorities identified by rural America as critical to the agricultural enterprise. Funds made available through changes in commodity support policy should show benefit to farmers, ranchers; their families, communities. This is an opportunity to address new and changing issues; to provide support for critical issues not currently being fully addressed. Those of us in the land-grant university system are eager to work with Congress and USDA on providing the research base and extension programs which will best support rural America and the total agricultural enterprise. The land-grant university system finds an especially appropriate partnership with USDA. A non or quasi regulatory agency provides a vehicle for research-based information which can be interpreted and made available to meet local needs.

Thank you on behalf of the Board on Human Sciences for the opportunity to comment.

Statement of

The Weed Science Society of America

before the
Subcommittee on Resource Conservation, Research, and Forestry
U.S. House of Representatives
Committee on Agriculture
March 27, 1996

Submitted by:
John R. Abernathy, Ph.D.
Texas Agricultural Experiment Station
Lubbock, Texas

Good morning, Mr. Chairman and members of the Subcommittee. Let me, first of all, express my appreciation for the opportunity to testify on the critical issue of agricultural research and priority setting. With your permission, I would like to summarize my testimony at this time and I will provide a more extensive written statement for the record.

My name is John Abernathy. I am the Resident Director of Research and Professor of Weed Science at Texas A&M. I am testifying today on behalf of the Weed Science Society of America (WSSA). WSSA is a nonprofit professional organization composed of approximately 3000 individuals and organizations involved in weed-related research. Our membership is a mix of state, federal, and private sector scientists. WSSA encourages and recognizes endeavors in education, research and extension related to weed management and provides a forum for information exchange through publications and meetings.

We appreciate the opportunity to provide testimony during this review of research priorities especially since weed science has become a "neglected science" in recent years. The decline in the priority given to weed science had occurred in spite of the importance of weed management to production agriculture.

Cost of Weed Management in Agricultural Production

Weeds pose one of the most important threats to our supplies of food and fiber and constitute an enormous economic burden in all agricultural areas. Losses in both yield and quality of crops due to weeds as well as the costs of weed control affect the profitability of production agriculture. Animal grazing is threatened by toxic weeds and processing is encumbered by weed seeds and biomass. Our most recent statistics reveal that the estimated average annual monetary loss caused by weeds for the 46 crops studied was $4.1 billion. This figure was determined using best management practices along with appropriate herbicide use. If herbicides were not available, this loss was estimated to be almost five times greater or $19.6 billion. Although these figures are our most recent, they are still at least five years old and, most probably, underestimate current economic losses due to weeds.

Role of Weed Management in National Goals

In 1993, a meeting entitled "Future Directions for Weed Science" was held in Washington, DC to discuss research objectives. An entire symposium on research needs was published in 1994 in Weed Technology. Furthermore, research priority setting is one of the charges of the WSSA Research Committee. Several of the recently established national goals and initiatives have weed management as a core component.

IPM: The Integrated Pest Management (IPM) Initiative has a goal of 70% of cropland utilizing IPM by the year 2002. Since approximately 70% of the pesticides used in agriculture in the U.S. are herbicides, weed scientists must be engaged in IPM research to accomplish such a goal.

Natural resource conservation: Another national priority is the conservation of natural resources. Perhaps the greatest and most permanent damage to the environment caused by agriculture is through soil erosion. Thus, a primary objective of agricultural research should be that of reducing soil erosion. The greatest single cause of soil erosion is tillage and cultivation. The major reason that farmers till and cultivate is to control weeds. In the U.S. there is a rapid shift to greatly reduced tillage and no-tillage agriculture. The biggest impediment to this transition is inadequate weed control. Even when there is adequate weed control, it is usually at the cost of increased dependency on herbicides.

An important aspect of natural resource conservation is pesticide risk and use reduction. Herbicides and their degradation products are the most common pesticide contaminants of surface and ground water. This is not surprising because, again, herbicides comprise the majority of chemical pesticides used in U.S. agriculture. However, when compared to research funding for pesticide reduction and non-chemical approaches for insect and plant pathogen management, relatively little funding has been available for comparable research in the area of weed science. Some high priority research areas in weed science that will contribute to herbicide use and risk reduction include:

- Biocontrol of weeds
- Precision application or placement of herbicides
- Computer decision aids for minimizing herbicide input

- Determination of environmental fate of herbicides in different weed management systems.

Noxious weeds: Non-native, invasive weeds are a growing problem in both agricultural and non-agricultural lands. Robust and virulent imported weeds such as leafy spurge, spotted knapweed, purple loosestrife, and tropical soda apple have become major problems in a short period of time. Research to discover and develop management or even eradication options to deal with these unwanted immigrant weeds is of high priority.

National Research Priority Setting and Coordination

My preceding remarks have focused on the role of weed management in addressing national issues and initiatives, as well as specific priority areas that the weed science communities feel need greater attention. In the remainder of my remarks, I would like to address the "priority setting" process and the need for increased coordination among federal and state partners. We are well aware of the intense discussions that have taken place over the past several weeks regarding research priority setting issues as the House and Senate have worked their way through the Conference process over the 1996 Farm Bill. In light of the Committee's plans to draft new research legislation within the next two years, I would like to especially focus my remarks on some of the critical issues that were debated but not fully resolved during these past few weeks.

"Stakeholder Input"

Agricultural research serves a number of clients and customers. Farmers, processors, commodity groups, farm groups, agribusiness, environmentalists, and public interest groups are all "stakeholders" and beneficiaries of the research that is supported by USDA and the Land-Grant Universities. We feel that it is critical that stakeholders have a place in identifying their concerns and priorities so that their needs are appropriately addressed. Moreover, we feel that there needs to be ongoing interaction between research scientists and stakeholders to insure that the scientific community does understand the needs of their stakeholders and to insure that their priorities are truly addressed.

The Texas Agricultural Summit Initiative was begun in 1993 as a process to involve our stakeholders in the agricultural agenda of the future. Major summit meetings have been held which involved 1500 stakeholders in the development of priority issues and mechanisms of resolution critical for the future of Texas agriculture. This process included representatives from commodity groups, media, consumers, processors, environmental, state and governmental agencies, and agribusiness. The Texas Agricultural Summit could serve as an example and experience in research priority establishment.

Peer Review

Competitively awarded research grants funded through USDA are subject to a "peer review" process that insures that the grants are awarded on the basis of technical and scientific merit. The peer review process was established to make sure that the "best science" is funded and to prevent the awarding process from being subject of political or personal agendas. While the process can be improved, the "peer review" process has played a critical role in protecting the integrity of the research process.

The Respective Roles of Stakeholder Input and Peer Review

During the past few weeks, there was a debate regarding the inclusion of stakeholders on peer review panels. Some would argue that stakeholders must be involved in the actual award process or scientists will go off on esoteric tangents and not stay focused on "real world" problems. Others would argue that it is absolutely critical to protect the integrity of the peer review process, so that we do not develop a "political correctness" test for funding research projects. We feel that both sides in this debate had legitimate concerns. Stakeholders should be able to see that research is relevant to addressing their real world problems. The quality of science should be protected and peer review of research should not be compromised.

The challenge is to work out mechanisms that allow for both objectives: stakeholder input into priority setting and science based peer review. These should not be contradictory objectives. We do not propose a solution here; indeed, we don't think it is possible for any single interested party such as WSSA, to propose a solution for all other groups. Rather, we suggest that an ongoing discussion needs to take place over the coming months among the full array of research stakeholders to develop mechanisms and processes that meet the needs of all. The Department of Agriculture and the Land-Grant Universities need to participate as the managers of research funds. The scientific societies need to be involved as organizations that represent the performers of research. Farmers and processors need to be involved as the implementors (and sometimes also the performers) of research and research findings. Farm groups, the commodity groups, agribusinesses, processors, the environmental community, consumer advocates, and proponents of sustainable agriculture need to interact as the customers of research.

The challenge to address the roles of stakeholders and scientists in research priority setting issues developed over the past few weeks. These Hearings and the promise of future legislation creates opportunities to address this challenge. The WSSA would welcome the opportunity to work with the Committee and the full array of interested parties in working out new mechanisms that meet all of our objectives.

Coordination

As a closing thought, we would urge that a concerted effort be made by the USDA-ARS, the Department of Interior, and the U.S. Forest Service to combat the problem of noxious weeds on public lands.

Closing Comments

Again, I thank you for the opportunity to provide input for the Weed Science Society of America into this review process. We look forward to working with you in the future.

Statement by Joe Anderson

First Vice President

U.S. Canola Association

before the House Committee on Agriculture
Subcommittee on Resource, Conservation, Research and Forestry

March 27, 1996

Good morning Mr. Chairman and Members of the Committee:

I am Joe Anderson, a farmer from Potlatch in the Panhandle of Idaho. I raise wheat, barley, lentils and canola in rotation on my farm. I am currently First Vice President of the U.S. Canola Association. I appreciate the opportunity to appear before you today.

Mr. Chairman, the role of the Federal Government in agricultural research and education has traditionally taken two distinct paths:

1. To address broad national or regional concerns and opportunities through Federal agencies like USDA's Agricultural Research Service and Economic Research Service; and
2. to address regional and local concerns and opportunities through the Land-Grant University system.

This dual approach has served the needs of the food and agriculture system very well in the past. It has provided tools necessary for supplying the most healthful, most diverse, and lowest cost food and fiber supply in the World. It makes possible exports of substantial quantities of not only raw products but value-added products as well. This has happened with a lower per capita expenditure for research and education than that of most developed countries. However, as technology, markets, and public perception have changed, agencies have broadened their areas of involvement. User group interest, political considerations, and administrative zeal have all led to a less than clear statement of the role and mission of various agricultural research and education units.

This diversification of interest by agricultural research and education providers has been coupled with an erosion of Federal funding over the years, in terms of constant dollars. Duplication in addressing some issues and inadequate attention to others is the result. As a more diverse clientele becomes involved in trying to influence the research and education agenda, the issue of focus becomes even more difficult. And cooperation and collaboration among scientists receive little reward.

Priorities for agricultural research and education must always be established based on criteria of market demand, product quality, cost, health and safety, environmental sensitivity, efficiency in the use of inputs, and adequate returns to labor and capital for agricultural operators.

But over the years, funds for problem-solving types of research, so critical to the profitability and competitiveness of production agriculture, have been severely reduced. It has been increasingly difficult for scientists to attract funds to do research in such areas as variety development, agronomy, and integrated pest management. At the same time the need for this type of research has never been greater. Our foreign competitors have seen this opportunity: solve production problems, reduce production costs and increase market share.

During this same period, there has been an increasing tendency to set our research and education priorities and agenda in Washington. The result has been that Federal priorities have become too general and too broad to address problems that are specific to regions or local areas. But production agriculture is conducted regionally and locally. Production challenges in one area of the country may be very different from those in other areas. But there also may be similarities. The competition for funds may become more acute, but it is imperative that systems be designed that enable limited funds to be efficiently programmed and targeted to address the most critical concerns and opportunities. Differences and similarities that exist throughout the country must be recognized. Unnecessary duplication must be eliminated. But to maintain competiveness and achieve profitability in production agriculture, regional and local problems must be addressed and solved.

For many types of agricultural research and education programs, the proper role of the Federal government must be to provide an incentive for the research and education community, including both Federal and State; producers; and industry to work together. The time has passed when the Federal government could be relied on as the sole funding source for agricultural research and education programs. But Federal support can and should provide the leverage to bring various stakeholders and funds providers together in coordinated, cooperative efforts that address the critical problems facing production agriculture.

The Federal government should target research and education funds to encourage state universities, Federal scientists, private industry, and producers to pool resources, allocate responsibilities, and share information on a regional level to solve problems that are significant to producers in that region. Priorities should be established at the regional level by producers and industry representatives. Best scientific practices should be ensured by regional peer review. Also it is essential that information gained through regional efforts be shared nationally. And every opportunity for interregional cooperation must be sought.

This concept of a regionally managed but nationally coordinated research and education program is successfully demonstrated by the National Canola Research Program (NCRP). Canola is a relatively new crop to the U.S. It has the potential to grow where small grains are grown. Small grain producing areas have a critical need for alternative crops from the standpoint of both agronomics and economics.

The National Canola Research Program has been developed using the priorities and principles I have outlined. It provides the science and education base for products that are increasing in demand, for a healthful and nutritious diet, not only in the U.S. but World-wide. The objective is to utilize a limited Federal appropriation to encourage efforts by farmers, state universities, state departments of agriculture, Federal agencies, and private companies and foundations to establish and participate in a nationally coordinated but regionally managed science and education program for the benefit of producers and marketers of canola and canola products.

Because the crop is new to the U.S., support for production research on canola and rapeseed was very limited. In defining how to structure a national program, it was evident that each of the potential producing areas reflected some similarities and some differences. It made no sense to develop fully integrated programs at universities in each State where the crop was being grown or where it could potentially be grown. And it also made no sense to develop a centrally managed program for a crop whose adaptation to various producing regions is evolving. But without a science and education base to support it, the crop could never reach its full potential to supply an increasing share of market demand.

This logic was shared with Members of Congress who have seen fit to provide annual appropriations for the Program. Interested universities saw opportunities for their producers and were willing to commit some resources. Producers of the crop have agreed to support the goals of the program through legislation to implement a National Canola and Rapeseed Check-off Program. A number of States either have or will soon have State check-offs. And private companies are developing products and technologies.

Under the NCRP, the Nation is divided into six regions that have potential for canola production and have demonstrated some interest in the crop. Appropriated funds are divided among the regions. A consortium of interested universities in each region is in place. A lead institution has been identified in each region to manage the program. An industry advisory committee of farmers and industry representatives and a technical advisory committee of scientists have been formed in each region. Each region is represented on a National Coordinating Committee.

The advisory committees within each region call for proposals from scientists within the region. The proposals are evaluated based on relevance in addressing priorities established for that region. Each proposal is peer reviewed for scientific merit. Then, together, these advisory committees recommend projects for funding. The National Coordinating Committee compiles information from each region and disseminates that information. It also suggests ways that regions might work jointly to address common problems.

This mechanism is in its third year of operation and is already beginning to provide solutions to problems that farmers face in establishing and growing this crop. Acreage of the crop is expanding. American farmers will soon provide for an increasing share of the demand for canola oil, not only in the U.S. but around the world. And it will not take decades.

The Federal Government cannot and should not play a dominant role in funding and managing agricultural research and education programs. The National Canola Research Program clearly demonstrates that a relatively modest Federal appropriation can serve as a catalyst to stimulate funds from State appropriations, producer check-offs, private company investment, and various other sources to build an effective system for science and education for U.S. agriculture.

RICHARD D. GODOWN, BIOTECHNOLOGY INDUSTRY ORGANIZATION

We appreciate the opportunity to appear before the Subcommittee on Resource Conservation, Research and Forestry and offer our views on support for agricultural research.

The Biotechnology Industry Organization (BIO) represents more than 570 biotechnology companies, academic institutions, state biotechnology centers and other organizations in 47 states and more than 20 countries. BIO members are involved in the research and development of health care, agricultural and environmental biotechnology products.

BIO member companies market over 90% of the biological pesticides sold in the United States. Our companies are conducting the ground breaking work on insect and disease resistant crops as well as herbicide tolerant crop that will reduce the use of chemical weed controls. We are also working on delayed ripening to improve harvesting, transportation and shelf life. And we are working on improving starch and solid content as well as oil composition for better health and improved processing. There is also a constant effort to produce improvements in protein content and flavor and nutrition. Over 40 crops are being improved in one aspect or another in laboratories and green houses around the country. In a real sense the new biotechnology has come to agriculture in a major way and the nutritional, environmental and economic benefits are there for all of us.

Let me now address U.S. agriculture and detail how agricultural technology perfected here, can result in market leadership for America in the 21st century.

U.S. agricultural and global needs: The biggest single challenge of the next century will be to further develop sustainable agricultural production systems that can meet the food and fiber needs of the world population without damaging the environment. The United States is in a unique position to meet this challenge and in so doing, to revitalize a key engine for sustainable economic growth in the increasingly international markets of the 21st century.

Agriculture has always been a key component of the United States' economy, however, despite its significant contribution to Gross Domestic Product (GDP) and even greater contribution to export earnings, its strategic importance is undervalued. This is because its relative economic contribution has slowly declined and the vast bulk of agricultural enterprise is currently dedicated to the efficient but unglamorous production of bulk commodities.

In the 21st century, the integration of smart genetics with smart chemistry and smart engineering has the potential to transform United States agriculture into a value-added, knowledge-based industry that will grow massively in both absolute value and relative to the rest of the economy.

Agriculture has unique strategic significance for the United States because this nation not only leads in the development of new agricultural technologies, but also has the world's most skilled farmers and the largest reserves of land with sustainable productive potential. Unlike many other fields of industrial knowledge in which the United States, subject to a willingness to provide additional strategic support for basic science, can choose to remain pre-eminent, applications in agriculture will remain fully-integrated on U.S. soil. The national agricultural production base will become an invaluable strategic asset as global demand for food and value-added biomass booms while alternative production capacity shrinks.

This is an optimistic vision, however, one based on an objective assessment of the potential for new agricultural technologies to meet the following critical needs.

i) For the developed world - better quality, healthier and better value food to ensure that the role of nutrition in disease prevention can be maximized to reduce the costs of therapeutic health care.

ii) For the developing world - dramatically increased availability of affordable basic food; primarily to meet population growth in Asian countries, many of which will be able to pay for imported food from strategic producers such as the United States at unsubsidized world prices, even though these will gradually rise.

Industry's projections concur with those from independent bodies such as the Worldwatch Institute that the supply/demand balance for all major food and feed grains and protein crops will become critical within 10 years.

iii) For the whole planet - increased sustainability and reduced environmental impact not only of agriculture, but also of many other basic industries such as pulp/paper, plastics and fuels to which renewable raw materials from biomass, which are designed for more efficient and cleaner processing, will make a critical contribution.

In the United States, meeting these challenges has the potential to deliver secure, well-paid jobs not only for farmers, foresters and their traditional customers, but for a growing number of new downstream industries that will rely on farm-outputs as a raw-material and a source of added value.

While many other technologies have a role to play, biotechnology is the critical element in the total package - without it we will simply fail to meet the challenge. This technology based on precise modifications to well-characterized genes is evolutionary. However, the resultant step-changes in quality, value and reduced environmental impact have revolutionary potential.

The total end-use value of food, fiber and forestry biomass is estimated to be over $500 billion in North America alone, and over three times this for the whole world. Thus the addressable market on which value can be added and costs saved is 6-7 times that of their respective pharmaceutical counterparts. This contrasts with the considerably smaller strategic investment - both public and private - made in agricultural applications of biotechnology compared with medical areas. Of the $7.7 billion invested by the United States industry in biotechnology research and development in 1995, less than 8% was for agriculture. The statistics for public investment are only slightly better.

A major explanation for the earlier and larger industrial investment in medical applications is simply that as a result of decades of higher cumulative public investment in medical research, the basic scientific understanding of human and mammalian biology and diseases is at a considerably more advanced stage that for plants and their pests. The agriculture biotech products that are currently in development are derived from the few areas in the field where the basic science is relatively advanced. Many have their origins in transfers of technology and/or trained R&D staff from the public sector to the private.

The time has come to commit a substantial increase of funding for basic agricultural research to broaden and speed up the process of technology transfer. These should be used to complete the nation's fundamental knowledge base of plants and their interactions with pests and the environment. An understanding of the physiological components critical to yields in major agronomic and food plants could lead to increased yields and a more plentiful supply of food. This understanding can also lead to increased production of value-added products by plants for use as industrial feedstocks. By increasing the amount we spend on research, we can build on the United States' current competitive advantage in the technology and so position its farmers and companies to seize the opportunities outlined above.

This is not the first time that the case for increased funding has been made. It is the biotechnology industry's view that the competitive grant and integrated pest management programs of the National Research Initiative (NRI) remain the best vehicle to ensure that any increase in public investment is allocated to achieve optimal returns.

The strategic challenge which we urge the Senate and House agriculture committees to grasp is investment in agriculture's future: increase commitment to cutting edge research through redirection of funds from commodity subsidies. While maintaining deficit reduction as the paramount goal, a portion of savings from scaling back subsidies over the next five years should be directed toward building the NRI to its authorized, full funding of $500 million. A trust fund of sufficient principal to generate interest to support the $500 million annual program level would be ideal. At a minimum, though, some means for shielding the expanded research investment from the vagaries of the annual appropriations process must be found.

We believe that there would be strong support from both the Administration, the public and all branches of agriculture for removing the annual threat to his highly strategic investment posed by the appropriations and budget reconciliation processes via the proposed reinvestment mechanism.

United States' farmers are already the most competitive in the world in many major crops. The strengthening of the United States' public funding for agricultural biotechnology research will ensure that they remain the most profitable as subsidy-driven price and trade distortions are gradually dismantled throughout the world.

Specific Action Requested: The specific action we seek is support for the National Research Initiative (NRI), the competitive grant program under the Cooperative State Research, Education and Extension Service (CSREES). The NRI, a proposal of the Board of Agriculture of the National Research Council at the National Academy of Sciences, was incorporated into the 1990 Farm Bill. It has been funded at approximately $100 million for the last five years, which is only twenty percent of the target level of $500 million recommended in 1990. The NRI is currently funded at $96.75 million, approximately $30 million less than the USDA 1996 budget request.

The NRI was reauthorized in both the House and Senate versions of the Agricultural Market Transition Act of 1996. The Senate Farm Bill authorized $500 million for each fiscal year from 1995 to 2002. The House version of the bill authorities $500 million a year for the next two years.

BIO supports the extension of the NRI in the 1996 Farm Bill and urges that the USDA investment in research be incrementally increased over the next seven years to build up the NRI annual funding to the recommended level of 500 million.

Integrated Pest Management: We would like to draw special attention to the integrated pest management systems proposal which is part of the overall NRI program and is designed especially to develop new technologies that maximize the use of biological and natural control of pests.

Food crops are subject to many pests that have various effects on yields. Weeds compete with plants for nutrients and water. Insects prey on plants and in some instances can devastate an entire season's planting. Viruses and fungi can both reduce yields and certain fungi contaminate harvested grain rendering it inedible for food or feed use.

The development of chemical crop control agents over the past fifty years gave farmers tools to deal with the variety of pests affecting agriculture. however, this development has not come without a price.

Many of the pests developed resistance to the chemical controls over time.

Integrated Pest Management (IPM) consists of a set of strategies designed to minimize pest infestations so that sustainable yields are maintained. They are crop dependent and depend on a solid understanding of the ecological system to be managed. Combinations of pest control methods are commonly used and can involve cultivation practices, resistant cultivars, as well as conventional and biological pesticides.

Biotechnology research is improving the outlook for IPM. New crop varieties, biopesticides, and pheromones will give American farmers better tools to manage pests in the years to come. To cite but a few examples:

- Virus resistance crops created through genetically engineering will stabilize production of a number of minor fruit and vegetable crops such as squash, cucumbers, and melons. Most plant viruses are insect transmitted and chemical insecticides were chiefly used to prevent their spread.

- Improved biopesticides are on the market that have better field performance than their predecessors.

- Herbicide tolerant crops will lead to better weed control using lower amounts of chemical herbicides.
- Insect resistant crop varieties will play an increasingly important role in the control of insect infestations on major field crops such as corn and cotton.
- Increasing knowledge about insect behavior will permit the better application of pheromones to disrupt insect mating.

Collectively all of these tools will delay the development of pest resistance. We expect that farmers will continue to see advances in crop yield as these technologies are developed.

In order to optimize the use of IPM, better cooperation is needed between USDA and EPA. Farmers need IPM information. We must continue to view this as a cooperative venture between industry and the agricultural specialists so that the value of various approaches can be communicated and implemented.

Mr. Chairman, BIO believes approval of these initiatives we've described will 1) increase the competitiveness of U.S. agriculture by investing in research and capitalizing on new developments in science & technology, 2) improve human health through research advances in nutrition and food safety and 3) sustain the quality and productivity of natural resources.

Funding research will improve the efficiency of food production and enhance U.S. international competitiveness while producing positive benefits for the environment.

Testimony of
Daniel R. Suiter, Ph.D.

Mr. Chairman and members of the Subcommittee, thank you for allowing me to testify today. My name is Dr. Dan Suiter. I am research director of the Industrial Affiliates Program, Center for Urban & Industrial Pest Management in Purdue University's Department of Entomology.

I appreciate the opportunity to share with you the views of my colleagues, both in academia and private industry. The colleagues I refer to are engaged in research on pests of the indoor and outdoor urban environments around structures. These pests directly influence the health and welfare of the American public.

The 1990 Census estimated the U.S. population at nearly 249 million. Of those, approximately 187 million, or 75 percent, reside in urban & suburban settings. It is evidently clear from these statistics, Mr. Chairman, that the United States is an urbanized society.

Urbanization naturally leads to increased threats from pests to our health, retail food supply, and property, costing the public untold hidden costs in health care, food, and housing. For instance, the importance of cockroaches in the development of allergies has been suspected for decades, but only recently have we come to fully appreciate their role in the promotion of allergic disease. It is estimated that 10-15 million Americans, many of them asthmatics, are allergic to cockroaches.

Wood destroying organisms, especially termites, cost the American public hundreds of millions of dollars annually in prevention, control, and repair costs of infested structures. Often, the financial damage from termites exceeds that of natural disasters such as floods, fires, and earthquakes. In 1986 it was estimated that subterranean termites cost the public $1.02 billion in control and repair costs from damaged homes and businesses.

To date the USDA, particularly the CSREES, has chosen not to prioritize research on a pest complex which directly affects the health, retail food and clothing supply, and shelter of 75% of the U.S. population. Pest control in urban environments intersects a larger segment of the U.S. population than does the agricultural sector of pest management.

It is vitally important that we develop technologies that will permit the implementation of more environmentally friendly pest management programs in the urban environment to protect our health, environment, food, and property. Ultimately, the benefactors from such programs are the general public. Research leading to safer, more effective control of urban pests would necessarily reduce hidden costs associated with health care and property repair. **In summary, we are asking this Subcommittee to prioritize research on pests of the urban environment.**

Once again, thank you for your time and attention.

Daniel R. Suiter, Ph.D.
Purdue University

THE EVALUATION OF FEDERAL PROGRAMS IN AGRICULTURAL RESEARCH, EDUCATION, AND EXTENSION

TUESDAY, MAY 14, 1996

House of Representatives,
Subcommittee on Resource Conservation,
Research, and Forestry,
Committee on Agriculture,
Washington, DC.

The subcommittee met, pursuant to call, at 9:07 a.m., in room 1300, Longworth House Office Building, Hon. Wayne Allard [chairman of the subcommittee] presiding.

Present: Representatives Gunderson, Barrett, Smith, Lewis, Crapo, Chenoweth, Stenholm, and Peterson.

Staff Present: John Goldberg, professional staff; Anne Simmons, minority consultant; Curt Mann, staff assistant; Wanda Worsham, clerk; Callista Bisek, assistant hearing clerk/scheduler.

OPENING STATEMENT OF THE HON. WAYNE ALLARD, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF COLORADO

Mr. Allard. The hearing of the Subcommittee on Resource Conservation, Research, and Forestry will come to order.

Good morning. I'd like to welcome all of you to the second in the series of three hearings this subcommittee will hold in order to review Federal programs in agricultural research, education, and extension.

In the first hearing, we evaluated the mechanisms by which the Department receives input from researchers and users regarding the goals and priorities of agriculture research, education, and extension. In the near future, we will hold a hearing focusing on information management and dissemination.

Today, however, we would like to take a focus look at federally supported intramural and extramural research programs. Specifically, in the case of agriculture, we have three major groups conducting agricultural-related research. First, there's the land grant universities, and land grant universities bring several strengths to the table, including the generation of fundamental knowledge and the education of the next generation of business leaders and scientists.

In many cases, the land grant universities have direct contact with their constituents in the various States. Some of these strengths, however, also have inherent weaknesses, such as the ability to maintain academic freedom, yet focus their efforts on specific outcomes.

Second, there is the USDA Agricultural Research Service, an inhouse research organization, much more highly structured, with the ability to direct its research efforts much like a corporation. The ARS has the ability to conduct long-term research cutting across State boundaries and can redirect its efforts relatively quickly.

Third, is the agribusiness industry ranging from service to producers through food and fiber processing. This industry has great strengths in conducting short-term development type research.

All three of these groups are, and will continue to be, critical elements in a national agricultural research strategy. And, as such, any evaluation of the agricultural research capacity of this country must include all three of these components in a dialogue that results in clearly understood roles for each.

This will allow the efficient utilization of limited resources by playing to the strengths of each and hopefully will reduce the amount of criticism of organizations that are being expected to perform in a manner which is inconsistent with their strengths and their culture.

Today, with the help of our witnesses, it is our intention to review the agricultural research programs conducted by Government, universities, and agribusiness, and to receive input regarding Federal policies that might facilitate improved coordination and efficiency within and between these programs.

Mr. Johnson, I understand, got in late last night and may not have one, but I'm going to call on any other members who may have opening statements for this hearing.

The gentleman from Idaho.

Mr. CRAPO. Mr. Chairman, I would like to make an opening statement if the time would allow.

Mr. ALLARD. That's fine, yes.

Mr. CRAPO. Thank you, Mr. Chairman. I appreciate the opportunity to be here with you in this hearing.

OPENING STATEMENT OF HON. MICHAEL D. CRAPO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF IDAHO

The research, extension, and education programs have played a critical role in achieving current productivity and competitiveness in U.S. agriculture, while providing taxpayers a rate of return of 30 to 50 percent per year.

Many years ago, when my great-grandfather came to southeastern Idaho, it was a wild country of breath-taking beauty, where only the most determined survived. Today, the original beauty of Idaho still survives, and that once wild country has become a significant producer of agricultural products. Because of the people like my forefathers, communities have been built throughout rural America, which not only provide this Nation with the safest and most abundant food supply of any Nation on the Earth, but also comprise the backbone of our Nation's economic and environmental security.

Agriculture currently faces many challenges and opportunities that extend well beyond the farm gate. And in order to address these multiple and complex needs we must reinvest in agricultural research, extension, and education, which has in large part been responsible for the current achievements in the productivity and competitiveness of U.S. agriculture.

There's a growing need for an infusion of resources that will provide problem- and opportunity-oriented research to meet the needs of the entire agriculture system. This call for a strong reinvestment in agricultural research, extension, and education has been a resounding theme at literally every meeting, forum, hearing, or workshop that I have attended or held over the past 2 years.

The rationale for this new agriculture research initiative within the Fund for Rural America is related to the importance of sustaining, and even increasing, the knowledge and technological base for U.S. agriculture to meet the demands of a global-free market. Research, extension, and higher education programs supported by this new agriculture fund would be expected to focus on both long- and short-term issues affecting agriculture.

The new research initiative was designed as an aggressive, coordinated research and education program between USDA, our universities, national labs, and industry, with agricultural industries playing a pivotal role in setting the priorities. For these reasons, I think it's imperative that the National Agriculture Research, Extension, Education, and Economics Advisory Board established under the current farm bill become actively engaged in research priorities.

I feel strongly about this new research initiative because I, along with many of my colleagues, have devoted significant effort to coordinating and developing legislation for the advancement of what has become known as "precision agriculture." Virtually no aspect of agriculture remains unaffected by recent advancements in precision agriculture technologies.

The positive impact precision agriculture promises to have on this Nation's agriculture could very well exceed the cumulative gains that we have made to date. I expect that as agriculture stands on the brink of the information age, the emergence of precision agriculture technologies and tools, coupled with a strong and appropriate Federal research and education role, can accomplish many of the challenges we face today.

Increased demands on the U.S. agriculture system will dramatically intensify the need for new knowledge and technology to allow the United States to sharpen its competitive edge in the world market, and to produce, as it has already, and processed nutritious, acceptable, and safe products that meet environmental and consumer standards.

To address these challenges, there is a growing need for an infusion of resources that will provide problem- and opportunity-oriented research, extension, and education, to assist the entire system. In the transition into a more competitive environment that is unfolding, while we also develop the next generation of knowledge, technology is needed to maintain our competitiveness.

The research component of the Fund for Rural America, which I support, will be administered by the USDA Cooperative State Research, Extension, and Education Service, with funds awarded based on relevant and quality proposals. It will be designed as an aggressive, coordinated program of research and education, with the agriculture industry playing a lead role in setting priorities.

As Government agriculture payments are reduced, it will be necessary to assist the U.S. agriculture and food system in transition to a more demanding and competitive environment.

I look forward, Mr. Chairman, to working with the Department and with the rest of the Agriculture Committee to promote a research program that will bring better balance to the total research and extension portfolio, while addressing those areas in which current funding relative to national agricultural research priorities is inadequate.

I thank you for this time.

Do any other members of the committee have any opening statements?

[The prepared statement of Mr. Johnson follows:]

STATEMENT OF HON. TIM JOHNSON

Mr. Chairman, thank you for calling this second in a series of hearings on research issues, specifically the research activities carried out by the Agricultural Research Service as well as those coordinated by the Cooperative State Research, Education, and Extension Service.

It is unfortunate that the House floor schedule did not accommodate more members being present, but I hope that our witnesses will not take the lack of crowd as indicating a lack of interest in this area. In fact, the issues surrounding the levels of funding to be supplied to the different types of research as well as where that funding comes from and who it goes to, are issues of great interest to all Members of Congress.

As the witnesses will allude to, there is a great deal of opinion as to what should take place in the research area. I hope that this hearing will help to bring those differences and agreements to light.

Mr. ALLARD. We are ready to proceed with the first panel. And we would be pleased to invite our first panel to the table, and our witnesses are Dr. Cathy Woteki, who is the USDA Deputy Under Secretary for Research, Education, and Extension. And she is accompanied by Dr. Floyd Horn, who is the Administrator of the Agricultural Research Service, and Dr. Bob Robinson, who is the Administrator of the Cooperative State Research, Education, and Extension Service.

As always, your complete written statement will be made a part of the record, and we would be pleased to receive your testimony at this point. We would ask that you limit your informal remarks to 5 minutes, if you would, and then we will open it up to questions from the panel.

STATEMENT OF CATHERINE WOTEKI, DEPUTY UNDER SECRETARY, RESEARCH, EDUCATION, AND EXTENSION, DEPARTMENT OF AGRICULTURE

Ms. WOTEKI. Thank you, Mr. Chairman. My colleagues and I are pleased to appear before you today to talk about the importance of agricultural research, and I would like to briefly summarize our written testimony, and then we would be happy to answer any questions you and other members of the committee may have.

With passage of the Federal Agricultural Improvement and Reform Act of 1996, and its increased reliance on markets, it has become clear that research to support the American food and agricultural system is more important than ever. FAIR changes the nature of Government support for the farm income safety net provided by commodities programs and steers American farmers toward reliance on the marketplace.

Our investments in research, extension, and education are central to enabling farmers to compete in domestic and international markets. And while these challenges are great, so are the opportunities for us and for our farmers.

At the same time, demands are being placed on the U.S. agricultural research system and they're growing. Consumers, producers, and taxpayers expect a wider set of issues to be addressed, including concerns of consumer health and food safety, environmental protection, and rural economic opportunities.

Federal expenditures for agricultural research now account for about 60 percent of the total financial support for public agricultural research in the United States. But Federal expenditures have not grown in real—that is, inflation-adjusted—terms since the mid-1970's. Our ability to reallocate existing resources to address these new and emerging concerns is very much constrained by this low growth in the Federal contribution toward research and by the increasing demands of these additional needs.

For example, as much as 30 percent of current public sector agricultural research goes simply to maintaining our current productivity levels. Increasingly scarce resources for public agricultural research place a very great burden on the administration of these resources and also demand a greater ability for us to shift resources into high priority areas.

Given these factors, it is appropriate and timely that Congress assess public versus private, and Federal versus State responsibilities in science and technology, and we welcome the opportunity to discuss these issues with you during this hearing and the subsequent hearing that will focus on information and educational issues.

In designing Federal policy toward agricultural research, we should consider a variety of approaches to support and encourage agricultural research in the United States. We need to consider how to strengthen the Federal-State partnership in agricultural research. We also need to encourage more public-private collaboration in agricultural research, so that advances in agricultural science and technology are quickly brought into widespread commercial use.

The administration made a number of proposals to be included in the research title of FAIR '96. Some were included, such as an improved advisory committee structure and a task force to evaluate federally funded research facilities. Congress also added a significant new authority in the Fund for Rural America, which will strengthen the Department's research and extension portfolio through grants competitively awarded to address specific problems.

Other proposals have not yet been adopted, and they remain important tools for strengthening our research capabilities, and ultimately increasing farmer profitability, protecting the environment, and providing consumers with safe, high quality food.

I would like to briefly describe four proposals that we believe are essential for strengthening agricultural research. These are in the areas of applied research grants, competitive facilities grants, maintaining genetic security, and reauthorization of aquaculture authoritie.

First, applied research grants. In an area of constrained budgets, it is increasingly important to reexamine the Federal-State research and extension partnership and to ensure that cooperative efforts in the national interest, leaving the States to support efforts that provide parochial benefits.

A case in point is CSREES's special grants program. About half the 1995 and 1996 appropriations for special grants were earmarked in the Appropriation Committee's reports. While earmarking Federal dollars may respond to a need to serve local priorities, a more coordinated approach would provide a coherent national strategy for focusing Federal investments.

We propose strengthening the Federal-State partnership for research and extension programs by establishing a competitive grant program for applied research that requires matching funds from States and would replace the current earmarking process for special grants.

Second, in the area of competitive facilities grants, like special grants we would desire funding for construction of agricultural facilities and university campuses not be earmarked in appropriations committee reports. In some cases, these facilities primarily serve a local or regional interest and address problems with limited national significance. In some instances, Federal funds have been earmarked to fund facilities, with little relevance to agriculture.

Although the review process provided in FAIR 1996 may lead to some improvements in this regard, we proposed the authorization of a competitive grant program for university research facilities to replace the current earmark process and to ensure greater equity and relevance of federally supported research facilities at the 1862 and at the 1890 land grant universities.

Third, with respect to maintaining genetic security, we have become increasingly aware that the long-term viability of American agriculture is dependent on public investments designed to collect and protect germplasm. Without such collections and related research programs, the United States may not have the ability to respond to future pests blights, and diseases, and we know that current collections are seriously underfunded and are, in some cases, actually deteriorating.

To maintain the genetic resources for our future food and fiber production system, we propose an authorization to create a new fund for genetic security. The Secretary, under this authorization, would be able to request $25,000,000 annually over the next 7 years to support the collection, characterization, preservation, and utilization of germ plasm to benefit U.S. agriculture.

Finally, aquaculture. Aquaculture is poised to become a major growth industry. Global demand for fish and seafood is projected to increase sharply over the next several decades, while harvests from wild catch ocean fisheries are stable or declining. A dramatic increase in aquaculture production is needed to meet future fish and seafood demand, and to offer domestic and international consumers abundant supplies of high quality, safe, wholesome, and affordable fish and seafood.

Aquaculture development also holds particular promise for rural communities because new aquaculture technologies can create new jobs and foster economic development in those communities.

The administration supports reauthorization of the Regional Aquaculture Centers and reauthorization of the National Aquaculture Act of 1980, with the following provisions: establishing private aquaculture as a form of agriculture for USDA programs; retaining the Joint Subcommittee on Aquaculture; and maintaining USDA's designation as the lead agency for coordinating policy and programs for private aquaculture through this joint subcommittee; including aquaculture in all authorities for USDA research, education, and extension activities; and establishing a program to accelerate the transfer of promising research and technical advances, including environmental technologies to commercial aquaculture applications.

As I said initially, we greatly appreciate the opportunity to discuss these and other issues with you with respect to our research programs, and my colleagues and I are happy to answer any questions you may have.

[The prepared statement of Ms. Woteki appears at the conclusion of the hearing.]

Mr. ALLARD. Thank you for your testimony. I assume you have Dr. Horn and Dr. Robinson with you to answer any questions. Is that correct?

Ms. WOTEKI. Correct.

Mr. ALLARD. Okay. The 1996 farm bill took some major steps towards phasing out the farm programs which have historically been focused on production and income supports, and we're replacing them with more market-oriented programs. How does the USDA plan to redirect its research programs and priorities to be more in line with the goals of this legislation?

Ms. WOTEKI. Well, we have a number of activities that are underway that will result, eventually, in redirection of our research priorities. Certainly, we are giving a lot of attention to the intent of the legislation and the purposes that are described in FAIR '96 for agricultural research.

We are also working with the agencies, the user community, the land grant universities, and the broader research community in identifying strategic directions for agricultural research under the requirements of the Government Performance and Results Act.

So I see both of these pieces of legislation as being very useful for us in helping us, first of all, to determine the directions that agricultural research should be taking, and, second, for providing us with the mechanisms, through strategic planning and yearly performance plans, as required under the Government Performance and Results Act, to actually begin the process of making those steps towards redirection.

As an example, we have idebtified five areas as the outcomes for agricultural research as part of our strategic planning activities. These are, first of all, an agricultural system that is highly competitive in the global economy. Second, a safe and secure food and fiber system. Third, healthy, well-nourished children, youth, and families. Fourth, greater harmony between agriculture and the environment. And, last, enhanced economic opportunity and quality of life for citizens and communities.

So I think you can see that some of the concerns in the directions for research, under the new directions in FAIR '96, are already being incorporated into our strategic planning.

Mr. ALLARD. Now, it's my understanding that you have not yet completed your work in establishing the advisory board. When I refer to the advisory board, I'm referring to the National Agriculture Research, Education, Extension, and Economics Advisory Board.

Ms. WOTEKI. Correct. We're in the midst of seeking nominations for that board. We have written letters to several hundred organizations around the country, leaders in agriculture research, in industry, and the various organizations that work with us.

Mr. ALLARD. Yes. We had some specific statutory provisions that in the process of setting these goals and objectives that you would use the advisory board. And since it has not been established yet, then you're telling me that the Department has gone on ahead and began to establish these goals and objectives without the advisory board being in place?

Ms. WOTEKI. We are in the process of establishing the advisory board, and we are making it a very high priority. As I had begun to indicate to you, we have solicited nominations, and we are moving forward as quickly as we possibly can to get that advisory board in place.

We believe that that board is going to be extremely important in providing advice to our programs on research priorities and on the various activities that we have underway in response to the new farm bill. But we are constrained in appointing that advisory board, in meeting all of the requirements of the Federal Advisory Committee Act. So it is going to take some months in order to get it established.

Mr. ALLARD. So what type of timeline are we looking at before you'll have that board appointed?

Ms. WOTEKI. We're probably talking about several months. I can't give you an explicit timeline. I can tell you that the nominations are due to us on Friday this week, and we will move very quickly to examine those and to get put into place a slate, which then has to go through certain approvals.

Mr. ALLARD. I would urge you to expedite getting that advisory board in place as soon as possible because I think that the members of the Agriculture Committee and what not have been playing a major role in setting the agenda.

You have elucidated five outcome-based objectives, and obviously you've set those without—and maybe you've set those with the intention of bringing those back into the board with discussion and wanting them to reevaluate that. But I hope that you will maintain and give that board the latitude to address their priorities from a user standpoint.

Ms. WOTEKI. I understand the sense of your urgings to us, and I very much agree with them, Mr. Allard. I have, in the past, worked with advisory boards and found them to be extremely helpful in bringing the views of the broader community in and helping us to reflect those in our research and education programs. And we certainly will be making it a very high priority.

Mr. **ALLARD**. Thank you.

Mr. Stenholm?

Mr. **STENHOLM**. Thank you, Mr. Chairman.

Dr. Woteki, Dr. Horn, Dr. Robinson, welcome to the committee this morning.

My questioning wants to be, first, along the line of we—as you are well aware, we had a reorganization of USDA and a restructuring, a redrawing of the boxes and the various duties of all of USDA. In some areas, it has been very controversial, and I must say I am very disappointed in the manner in which cooperation has been coming from the various agencies, and so has a good part of the rest of agricultural industry.

My question to you is, how is the reorganization structure, as passed by the Congress, working as it pertains to your shops?

Ms. **WOTEKI**. I might respond to that initially and then ask Dr. Horn and Dr. Robinson if they would like to respond.

I joined this mission area in January, and at that point in time we had some vacancies as far as administrators' positions. We have moved very quickly to fill those. And since we now have in place the REE mission executive team, you might call it, I think that overall the working relationships and the functional relationships within the mission area are developing very well.

We, as I had indicated, have had this additional requirement for strategic planning under the Government Performance and Results Act, and it has actually provided us with a very good opportunity to build this team and to work with the member agencies in the REE mission area to identify what are the common problems we are working on to improve coordination of resources within the agencies to bear on those common problems and also to begin to identify new ways for our research, education, and extension activities to be brought together.

So my sense is that, within the mission area, the reorganization is actually having some very, very positive effects.

We have also moved to put into place a mechanism for our mission area to interact with the other mission areas created under the reorganization. We have had the first meeting of what we're calling a Research, Education, and Extension Policy Council. The other mission areas within the Department are represented at the Deputy Under Secretary or Under Secretary level, and that is a mechanism for us to learn of their needs and concerns and for us to be able to respond to them.

Mr. **STENHOLM**. What is your biggest disappointment?

Ms. **WOTEKI**. I guess my biggest disappointment is everything takes a little bit more time, and perhaps a little bit more energy than what we'd like.

Mr. **STENHOLM**. Why is that? Why is it that everything seems to take a little bit more time?

Ms. **WOTEKI**. Perhaps because my expectations are a bit high. There are certainly a lot of additional issues and concerns that people have on their plate that—emergency situations that arise that kind of distract their attention from perhaps some issues that might be of greatest concern to us.

But I don't see, Mr. Stenholm, at least in my experience with the Department, any serious concerns about the reorganization as they are affecting our mission area.

Mr. STENHOLM. If I could follow up why everything seems to take so much time—the Chairman's earlier question regarding the advisory committee. Any guidance as to why that has taken what appears to be a little longer period of time and might be necessary? Or is that just a perception and that really everything is coming along as fast as it possibly could?

Ms. WOTEKI. Well, with respect to the advisory board, I do think that things are coming along as fast as they possibly could. We have moved very quickly to solicit nominations, and as I had indicated they are going to be closing at the end of this week.

There are certain legal requirements that we have to meet in order to establish committees like this, and at times those go beyond our ability to control the decisions that others make. But I believe, so far, that on the advisory committee we are moving very quickly.

Mr. STENHOLM. Mr. Chairman, in a follow up round, I would like Dr. Horn and Dr. Robinson to respond to the same line of questioning, after others have had a chance to ask questions.

Mr. ALLARD. The gentleman will be given that opportunity.

Mr. Barrett?

Mr. BARRETT. Thank you, Mr. Chairman.

Doctor, I'd like to spend a moment or two on the question of special research grants. There are a lot of funding mechanisms in order that we might conduct these research grants, extension programs, and so forth. You talked about, or we have talked about in the past, formula grants and special grants and competitive grants.

Could you share with us some of the relative advantages and disadvantages of each of these particular grants?

Ms. WOTEKI. I'd be happy to do so. I think I'd like to start by emphasizing that our approach towards the different types of grants is that they offer us essentially a portfolio of mechanisms to fund research, and each one has a special place.

The various aspects that we use for funding extramural research range from the competitively awarded, peer reviewed, and merit reviewed grants under the National Research Initiative, to the formula funds, to special grants, as you've indicated. Each one of these serves a different purpose.

And as far as the National Research Initiative grants go, the original intent for those was to focus on fundamental research of importance to U.S. agriculture that was not currently being funded, or was being underfunded through our intramural research program or through the research of other organizations that fund research.

So the National Research Initiative is focused, essentially, on fundamental research that meets needs of American agriculture.

Formula funds traditionally have gone to support the infrastructure for research in our land grant universities, and the special grants have evolved over time into a merit reviewed program without the peer evaluation that occurs for the scientific review under the National Research Initiative.

I'd like to ask Dr. Robinson if he would speak in more detail from an administrative perspective about the pluses and minuses of each one of those approaches.

Mr. **Barrett**. Dr. Robinson?

Mr. **Robinson**. Certainly, Mr. Barrett. Perhaps one way to approach these is to divide them perhaps a little more than Dr. Woteki has. Under the special grants area, there are really three different types of grants. There is a line item grant that is designated for an institution or for an area, or for both. Those generally are not competitive. They are specified in the appropriations language.

Those grants do receive, however, merit review, because once appropriated, proposals are solicited from the university that is affected, or the institution that is affected, and those undergo a merit review process which include a peer review, and more often than not a review both internally at the agency and with selected experts in the particular area of the project.

Another type of non-competitive grant is the building and facilities grants program. Those are often designated for a particular institution for a particular kind of facility designed for research and/or education. Those grants as well receive merit review and, in fact, often a broader site visit which looks at the proposed facility, the proposal that is submitted by the university, the planned use of the facility that is proposed, to give an early indication back to the Hill that, in fact, this seems to be a reasonable project to proceed with before the project is approved.

The third type of special grants is what we have termed "competitive special grants." These are designated, instead of for a particular geographical location or institution, rather, for a problem that is very important to agriculture. Some of these include IPM grants or the SARE Program, or other types of grants.

In these particular competitive grants, although they are special grants as well, we do set up more frequently panels of peers or panels of experts to review the proposals that are submitted, and, in fact, go through a proposal process not unlike the National Research Initiative, and, in fact, design panels to look at the proposals that are coming in, to rank those proposals based on scientific merit and relevancy.

Mr. **Barrett**. Thank you. My time has expired, Mr. Chairman. But, in conclusion, it would be safe to say that the special funding has some positive aspects that the other funding mechanisms do not have.

Mr. **Robinson**. Certainly. It takes a different approach than the National Research Initiative which, for example, are formula grants.

Mr. **Barrett**. Thank you.

Mr. **Robinson**. They look at specific needs.

Mr. **Barrett**. I may, too, like to come back to this subject later.

Mr. **Allard**. Let me call on Mr. Crapo.

Mr. **Crapo**. Thank you, Mr. Chairman.

And Dr. Woteki, Dr. Horn, and Dr. Robinson, we appreciate your being here today.

I want to go back to the issue of the advisory board which the chairman raised. And the question I have, Dr. Woteki, is is it correct that the administration has already drafted RFPs for the Fund for Rural America?

Ms. WOTEKI. No, we have not.

Mr. CRAPO. We have received some information that the Department is working on or is preparing those types of RFPs. Is that correct?

Ms. WOTEKI. No, we are not actually writing RFPs. We are certainly considering, at this point, a range of options for how one would implement the Fund for Rural America. As you have indicated, there are some explicit roles identified in the authorization for the advisory board for consultation with respect to the Fund for Rural America. So we are moving forward quickly to get the advisory board established.

In the meantime, while that is proceeding, we have, as I had indicated, begun thinking about, well, how would one go about establishing the competitive grants that are called for under the Fund for Rural America? What are some of the outlines of a competitive grant program? Certainly, there are a whole wide range of decisions, or at least options, that need to be identified so that decisions can be made. We're in the planning stage at this point for the Fund for Rural America.

Mr. CRAPO. So if I understand you correctly, then, the Department is not going to redirect priorities, or establish the allocation of funding, or the implementation of the research and extension component of the Fund for Rural America before the advisory board is established?

Ms. WOTEKI. It is difficult, at this point, to say with great certainty when the advisory board will be established. I want us to move forward with all due speed to get that advisory board established, because the board clearly has an important role to play in providing advice to us on all of our programs, as well as for the specific role that it has called for in the Fund for Rural America.

There are, though, certain roles that are ascribed to the advisory committee in the legislation and some that are ascribed to the Secretary. And we will consult with the board about the development of this program, but as I had indicated it is difficult to know with exact certainty when that board is going to be established.

Mr. CRAPO. Well, one of the concerns I think that I am getting at, and I think that other members of the committee probably share, is that the legislation created a statutory obligation for an advisory board to be created, and for the decision making on redirecting of priorities, and for the implementation of the Fund for Rural America to take place with the advice and consultation of that board.

And I'm just concerned that, from some of the information we are seeing, it appears that the Department may be getting out in front of that as a result of the board not yet having been created and made effective.

Ms. WOTEKI. Well, I think you can understand the difficult situation that we're in. The legislation, just being recently passed, sets out many different requirements, all of them high priority, and many of them flowing through the advisory board.

So, clearly, it's a very high priority to us to get that board established, so that it can fulfill the consultation that's required under the legislation as it relates to the Fund for Rural America. And we will move expediently towards establishing that board.

Mr. CRAPO. You indicated that there were some legal requirements that were causing some of the delays. Could you give us a little more detail on what legal requirements are causing the delays?

Ms. WOTEKI. Well, the main problem is meeting the criteria of the Federal Advisory Committee Act. We have to identify a slate of candidates. There are a number of different requirements under that law that are beyond our control that have to be met, and it's those issues that are outside of our control within the Department that may lead to some delays.

Mr. CRAPO. Can you tell me what some of those delays might be?

Ms. WOTEKI. I don't have immediate knowledge of all of the requirements, but we'd be happy to provide them to you.

Mr. CRAPO. If you could, I'd appreciate that. I see my time has expired.

Thank you, Mr. Chairman.

[The information follows:]

Requirements to establish Advisory Committees under the Federal Advisory Committee Act

A great deal of groundwork must be completed before a statutory advisory committee is ready for business. The first step, and the one that takes a serious commitment of time and consideration, is the nomination and selection process. The Farm Bill (FAIR 96) is very specific about the composition of the National Agricultural Research, Education and Economics Advisory Board (NAREEB) and the Federal Advisory Committee Act (FACA) requires a "fair balance" of viewpoints.

Using this statutory guidance, we developed a very inclusive mailing list of over 600 recipients who were asked to nominate qualified people to represent their organization, industry, or professional group on NAREEB. We also published a notice in the Federal Register soliciting nominations. I am happy to report we received approximately 400 nominations. On the other hand, it took more time than we anticipated to review 400 submissions to ensure that these people are considered for the category where they have the most expertise and that there are no conflicts of interest. Also, prior to final selection by the Secretary, nominees must go through a routine background check.

The second step is the drafting of the charter followed by an internal Department clearance process. NAREEB must be chartered and in compliance with the FACA and Department regulations before it can meet or conduct any business. There are nine offices within USDA that must review and approve the charter. The drafting and clearance process is underway but it will take time to complete due to the complexity of the Board's responsibilities.

In conclusion, the establishment and operation of NAREEB has been a very high priority for Research, Education and Economics since President Clinton signed the Farm Bill on April 5, 1996.

Mr. ALLARD. Mr. Lewis, you're next.

Mr. LEWIS. Thank you, Mr. Chairman.

Dr. Woteki, would you provide in writing to the committee the five goals or outcomes that you mentioned to Chairman Allard earlier?

Ms. WOTEKI. Certainly, I'd be happy to.

Mr. LEWIS. Thank you.

[The information follows:]

Strategic planning and progressive management systems are critical for an organization to meet and manage change effectively. Accurate identification of current and potential problems and a timely and appropriate response are key to effective strategies, particularly in a rapidly changing scientific and technological environment.

The five outcomes and goals of the Research, Education, and Economics (REE) Strategic Plan will ensure that REE programs and resources stay focused and relevant to the needs of the 21st century. These goals were not developed in a vacuum. Indeed, each one reflects Congressional direction, as articulated in the priorities for research, education, and extension in FAIR 96, as well as recommendations and priorities identified by users, stakeholders and partners and submitted to the Under Secretary for REE, Secretary, and Congress. I am enclosing three of these advisory reports and I have briefly noted below their relevance to the REE strategic plan.

In addition, further input to the content of this plan is desired, expected, and will be actively sought. REE is using the World Wide Web to solicit agricultural community input to the strategic plan; is co-hosting, with university partners, three listening sessions across the country to hear the views of as many interested parties as possible; and will consult with and incorporate the priorities of the new National Research, Extension, Education and Economics Advisory Board before this plan takes effect in FY 1999.

The outcomes and goals of the Research, Education, and Economics (REE) Strategic Plan are as follows:

An Agricultural System That Is Highly Competitive In The Global Economy

UAB - Profitability and Competitiveness

JC - Improve Global Competitiveness of U.S. Food, Agricultural, and Forest Products

Riley Foundation Conference - farm-level profitability and increased competitiveness worldwide

A Safe And Secure Food and Fiber System

UAB - Consumer and Post-Production Issues

JC - Provide a Safe, Affordable, Reliable, and Nutritious Food Supply

Riley Foundation Conference - concern for food safety and food distribution

Healthy, Well-Nourished Children, Youth and Families

JC - Empower Individuals, Families, and Communities to Improve Their Quality of Life

Riley Foundation Conference - concern for hunger problems

Greater Harmony Between Agriculture And The Environment

UAB - Sustainable Agriculture

JC - Achieve Economically Viable Production Systems That Are Compatible With Environmental and Social Values

Riley Foundation Conference - more research for the joint purposes of achieving greater production cost efficiency through reduced need for costly inputs and reducing environmental risks on production activities

Enhance Economic Opportunity And Quality of Life For Citizens and Communities

UAB - Economic Development

JC - Help Develop Economic infrastructures That Attract and

Sustain New Investment in Rural Communities Riley Foundation Conference - provide new options for economic viability of small and mid-sized farms

Mr. LEWIS. Last spring I attended a precision farming field day over at Beltsville, MD. And I was interested to see that instead of USDA being on the cutting edge of precision technologies, such as yield monitors, global positioning satellite navigation, and variable rate application, and informing farmers has—you know, I was amazed that this wasn't part of the cutting edge technology that the USDA had been involved with, that had been in the private sector and farmers working on this.

Should the Agriculture Committee direct ARS extension and the Agriculture Research Committee to get up to speed on precision agriculture and other emerging technologies, or should we just leave modern farming technologies to farmers and the private sector?

Ms. WOTEKI. I recently had the opportunity to see how we are using remote sensing applications in some of our own programs. My sense is that we are at the cutting edge in applications for sur-

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vey activities, as well as for research purposes. And I'd like to call on Dr. Horn to give you a more explicit discussion of ARS's role in the development of precision agriculture and applications of some of these new technologies.

Mr. HORN. We certainly believe that we are on the cutting edge of precision farming technology. We spend about $4,300,000 a year on this research at 14 locations. The principal location is Beltsville, where we are using GIS and are dividing fields into very small components, so they can be managed independently using automated equipment and sensing equipment, and the like, with a wide variety of objectives. For instance, applying pesticides only where the pest exists and applying fertilizer only where it is needed.

I don't know why it would be suggested that we are not involved at the cutting edge of precision farming. We know of no stronger program.

Mr. LEWIS. Is this a result of your research, or is it a result of using the research that has been developed through the technologies that have been discovered through the private sector?

Mr. HORN. Both, the private and the public sector actually have contributed tremendously. A lot of the disciplines that led to the development of precision farming systems have nothing to do with agriculture. Remote sensing is largely a NASA/private sector activity. Global information systems have emanated from that.

We are making the use of all technology available to us to apply it to the problems of agriculture, and for farmers in particular. And, of course, it's the system that puts everything together that is of most interest to us, and that's our role as we see it, to draw from wherever we can find the technology.

Mr. LEWIS. Whether it's real or perceived, though, the farmers in my district are concerned that some of the traditional research community is locked away in an ivory tower, is out of touch, out of date, and they have a concern there.

Let me just finish up with this. With the tight budget times that are, of course, here in Washington, what current USDA research programs would you recommend Congress or USDA to eliminate or refocus in order to research the new technologies and farming practices?

Could you give me a list of 10 current USDA research programs you believe are outdated and could be eliminated or refocused on production and/or precision-oriented research? If you could do that in writing. You don't have to do it now, but if you could just submit that.

Mr. HORN. Thank you very much for that.

Mr. LEWIS. Thank you. [Laughter.]

[The information follows:]

As part of the Administration's FY 1997 budget request now pending before Congress, we proposed 47 specific research projects for termination in order to reallocate financial resources to more critical research in the national interest. Ten of the projects are as follows:

1. Nondestructive sonic sensing of firmness and/or condition of apples and other agricultural commodities.
2. Production and evaluation of tissue-cultured fruit crops.
3. Integrated management of Rhizoctonia seedling disease in alfalfa.
4. Partitioning of photosynthate as influenced by genotype, mycorrhizae and air enriched with carbon dioxide.

5. Biology, ecology and control of plant parasitic nematodes in field and range plants.
6. Genetic improvement of trees for soil and water.
7. Reducing rust-induced losses to small grains.
8. Modeling and simulation of integrated management systems for arthropods of medical and veterinary importance.
9. Roles that molybdenum-independent nitrogenases play in nature.
10. Automated growing and transplanting systems for plant seedlings.

Mr. ALLARD. I'd now like to call on Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman.

Help me understand how USDA analyzes or evaluates or recommends what amount of the available research money that we have at our disposal should go into what kind of broad efforts, and then how to distinguish within the different categories of where we might apply our research dollars, how those research dollars—how the decisions for how specifically to spend those research dollars are made.

I'm going to try to say that again. Does USDA have an evaluation that they present to Congress in recommendations of where these research dollars should be spent, in terms of the research that is designated through the appropriations process? And then, more than that, of that discretionary research funds, how do you decide where to spend the dollars? And I don't know what the divisions are, but possibly production agriculture, the environment, food and nutrition programs. How is that organized in USDA?

Ms. WOTEKI. Well, we have two processes to help us, first of all, set priorities and then budget. The priority-setting process is a consultative one. It is one in which with the new advisory board, when it is up and running, will play a prominent role. And as part of that consultative process, we also look to the other mission areas for what their needs are, and we have processes in place to solicit those regularly each year.

Mr. SMITH. I'm assuming needs far exceed the availability of funds.

Ms. WOTEKI. Always. Without question.

We also have an extensive mechanism where we solicit the views of the broader scientific community, through workshops, through various types of meetings that are held, so that we understand what the problems are in—that research and development could be put towards to try to help——

Mr. SMITH. And as of today, where are the conclusions of that effort?

Ms. WOTEKI. Well, I think you can see the conclusions of those efforts in a series of different reports that are focused on different areas of agriculture. Annually, we report to the Congress, for instance, on the Human Nutrition Research Program, and there are similar other reports that are prepared for you.

You can also see, though, where the priorities come together with our budgeting in the annual budget that we submit to you.

Mr. SMITH. And so what is happening, and what are the changes? What would be the other categories besides feeding and nutrition, basic research, production, agricultural research? What am I leaving out? Disease, seed, and environment?

Ms. WOTEKI. There are many different ways that you can—describe our research portfolio.

Mr. Smith. What are we spending now? What would be the breakdown of our research dollar in terms of the divisions of environment, feed and nutrition, and production agriculture? And maybe other.

Ms. Woteki. We have done such a cross-cutting analysis for the four agencies that are in our mission area. And if you look across basic applied developmental research, as well as our extension and our higher education activities, in agricultural research to increase competitiveness in the global economy—this is the research and education activities—about a quarter of our $1.7 billion in this mission area go into that area. So that's about $445 million in this fiscal year.

For food safety, it's about an equivalent amount. For nutrition research and other research for the development of health-promoting foods, it's about 16 percent. For research and education activities that are solving problems related to the environment, and agriculture's role in the environment, it is also about 16 percent of the $1.7 billion. And for research and education activities that are devoted towards economic enhancement and rural development activities, it's about 18 percent.

Mr. Smith. Thank you, Mr. Chairman.

Mr. Allard. Let me go ahead and call on Mr. Gunderson next.

Mr. Gunderson. I appreciate that, Mr. Chairman. I apologize for not being here earlier, but I would like to pursue a line of questioning I'm quite confident has not been asked by my colleagues.

It is really a follow up on some hearings that we have held in our Livestock, Dairy, and Poultry Subcommittee on research as it affects the whole issue of meat and poultry inspection. We recently heard about a sampling of particular food safety technologies, including steam vacuuming, irradiation, organic acid washes, et cetera. Most of these technologies have been created not by any kind of internal research, but, rather, by the meat and poultry industries, in conjunction with industry trade groups, and to some degree with the academic community.

How does FSIS interact with ARS in terms of pursuing research that might lead into better food safety standards, technology, and tools to deal with this? Can you give us any idea of that connection, or lack thereof?

Ms. Woteki. Yes. I'd like to ask Dr. Horn to describe to you the process that we use for learning of FSIS's research needs.

Mr. Gunderson. Sure.

Mr. Horn. We have a working relationship with FSIS that is several years old, perhaps 10 years old, by which they provide us annually with a list of high priority activities. And we address those by redirecting our programs internally and/or requesting additional resources. That has led us to the point right now where we have a $44,300,000 food safety research budget, of which $18,200,000 in fiscal year 1996 is applied directly to pathogen reduction, which is the highest priority of FSIS.

We also have other programs in toxic residues, mycotoxins, other drug residues, and the like, and poisonous plants. These are not as high on the FSIS list, and yet we see them as very important, which is to say that in addition to what we do directly for FSIS in a particular year, or in a particular 2- or 3-year project period, we also do have other food safety research that we do in consultation with the industry and other user groups, consumer groups, and the like.

Our sense is it's a good thing we do have these other food safety programs. As a result, we spotted the coming E. coli issue before it emerged as a serious public health problem. We did the same thing with listerosis, and our technologies have reduced listeria by 50 percent, because of the sanitation technologies developed by ARS.

So it is a multi-faceted program, more than just what FSIS asks us to do in a particular year, but it's a fairly well-structured relationship. And, incidentally, that's the sort of relationship we want with all of the action and regulatory agencies, and we believe the internal REE Policy Council will help us in that regard.

Mr. GUNDERSON. Do you support the provisions of the farm bill dealing with the science panel?

Mr. HORN. Are we talking about the internal——

Mr. GUNDERSON. No, I was talking about the external.

Let me pursue a different line of questioning, because we've got a timer on. Talk to me about the role of ARS regarding the Megareg. I mean, as you know, we are developing this whole new standard on hopefully HACCP—Hazard and Critical Control Point. The question is, to what degree do we develop these regulations based on science?

Is ARS involved initially in the development of that regulation? Are you involved in the middle of the process? Do you review the proposed regulation. before it goes to OMB from a science—to see to what degree it is science based and to what degree it is not? What is your involvement in this, and what, frankly, should it be?

Mr. HORN. I believe that ARS has a great deal to do with the general concept that we should move to a science-based regulatory environment. And ARS was involved in much of the fundamental research that led to the development of methods of detection and methods of monitoring, and we have been working hand in glove with FSIS in order to move that set of activities into the mainstream.

I would say we have been working at least that much, too, with industry to see if these things are realistic in the workplace. We have tested in processing plants a number of different sampling technologies, for instance, and fed that information to FSIS so that they could incorporate it into the rule.

Another important role that ARS has played is to take part in the risk assessment activity, and we have advised again and again as to what we think is, in fact, science based and realistic in the workplace, and we see that as an important role. That has not been a completely satisfactory process to date, but we are providing objective information to FSIS in hopes that that will improve the rule making process.

Ms. WOTEKI. I might add, also, Mr. Gunderson, that as the rule has been undergoing its final review within the Department in the last several months, that not only ARS scientists, but statisticians at NASS and economists at ERS, have been involved in the review as well.

Mr. GUNDERSON. Just a quick follow up, Mr. Chairman.

Mr. **ALLARD**. Go ahead.

Mr. **GUNDERSON**. Let's say there's provision *X* in the Megareg. Will you look at that, and will you comment to FSIS and say, "You know, if you want to do this for some other reason, that's up to you. But there is no scientific basis for this provision"? I mean, do you do that kind of analysis?

Mr. **HORN**. Absolutely.

Ms. **WOTEKI**. Without question.

Mr. **GUNDERSON**. All right. Good. Thanks.

Thank you, Mr. Chairman.

Mr. **ALLARD**. Do we have a list in your department of the agricultural research activities that are going on, both in extension, agricultural research? And have you tried to make any attempt to compile this kind of information from the private sector?

Ms. **WOTEKI**. Yes. We do have, in fact, a computerized system that allows us to identify research that's ongoing, well as who is conducting it and at least a summary of the research activity that's underway.

Mr. **ALLARD**. Is this publicly available?

Ms. **WOTEKI**. Yes, it is.

Mr. **ALLARD**. How can individuals get hold of that information?

Ms. **WOTEKI**. Well, I'm going to ask Dr. Robinson to give you some specifics about that. But before we move to that, you did ask about private sector research.

Mr. **ALLARD**. Yes.

Ms. **WOTEKI**. That's an area that we do not have information about, except what is shared with us in the scientific meetings and through publications, and that type of activity.

Mr. **ALLARD**. And I can understand why the private sector would have some proprietary concerns. But you do have a list of some of the things that are being done that are made public, at least in scientific meetings in the private sector. Is that correct?

Ms. **WOTEKI**. Correct.

Mr. **ALLARD**. Yes.

Ms. **WOTEKI**. And we have regular interchange with industry scientists through either meetings that we convene about a specific topic, or that our professional societies might hold.

Dr. Robinson?

Mr. **ROBINSON**. Yes. Perhaps I could follow up just a little bit, Mr. Allard.

The internal system that we use is called the Current Research Information System. It is currently under review. A committee has been appointed and is currently working to try to get more specifically at a more comprehensive system that will allow more information of a specific type—that will allow us to address issues of priority or returns to public investments and research of different types. We are not to that point now.

The budget request from the Department this year requests funds to allow us to better design/redesign the CRIS system. Two critical things are missing from that system now, as you mentioned yourself. One is an information base on private sector research. And, as you point out, that information is proprietary in many ways, but as much of that as could be obtained and entered into a research system would be enormously beneficial.

A second component is extension programming, particularly extension programming which relates to various types of research. We do not have extension currently integrated in this system. What we are working toward is perhaps a system that can be linked to facilitate understanding the relationships between extension programming and research.

Mr. ALLARD. The Internet has become universally accessible. Are you using the Internet?

Mr. ROBINSON. CRIS, as it stands, is currently available on Internet.

Mr. ALLARD. So you can go on the Internet, and you can go into a World Wide Web page and you can get a list of research that is being done by the Department.

Mr. ROBINSON. Research being done by the Department, by the land grant university system, by others who participate, for example, in the National Research Initiative by ARS.

Mr. ALLARD. Can you give us, though, that call sequence?

Mr. ROBINSON. We certainly can. We will provide that.

Mr. ALLARD. I think it would be interesting if your Department gave us a list of sources that you can pick out the World Wide Web, and the address, and how you can get those.

[The information follows:]

World Wide Web Addresses for the Research, Education, and Economics Mission Area

USDA Home Page http//www.usda.gov
REE Home Page http//www.reeusda.gov/ree.html
ARS Home Page http//www.ars.usda.gov
CSREES Home Page http//www.reeusda.gov
ERS Home Page http//econ.ag.gov
NASS Home Page http//usda.gov/nass/
Current Research Information System http://cristel.nal.usda.gov

Mr. ALLARD.Now, on the rural development fund, one–third of those funds was to be set aside for research and, say, extension. How does the Department intend to implement the research and extension component of the Fund for Rural America?

Ms. WOTEKI. We are, at this point, considering a range of different options for how to implement the Fund for Rural America. Clearly, we understand, as the statute defines, that these funds are for research, extension, and education, and that they are to address the eight areas that are identified in the legislation that emphasize international competitiveness, efficiency, and farm profitability, and a variety of other issues of importance to agriculture.

At this point, as the law indicates, these are to be grants that are competitively awarded, that there are a variety of different individuals and institutions that would be eligible for the grants. Certainly, researchers at colleges, universities, or research foundations, national laboratories, and private research organizations, are eligible, as would be smaller institutions for which there is a 15 percent of that fund that will be set aside for those institutions.

Mr. ALLARD. So the question is how are you implementing this?

Ms. WOTEKI. At this point in time, we are developing a set of options. This will be a competitively awarded grants program that will be administered by the Cooperative State Research, Education, and Extension Service.

Mr. Allard. Okay. Thank you.

Now let me call on the gentleman from Texas. I think he had some more questions he wanted to ask.

Mr. Stenholm. Yes. And Mr. Gunderson got into the specific line of questioning that I wanted, Dr. Horn, for you to respond to, in regard to my first question. And I want to pursue that a little further, because it has been my experience in the past that we have not had the kind of cooperation that you've just described that you are now internally using within the Department for purposes of ascertaining priorities within the Department.

In the past—I forget who it was that used the term "ivory tower," but I think that has described the ARS in the past. But in your response to Mr. Gunderson, I detected that there was a change, and is a change, and that's something that had to happen, and that was why I was asking specifically if there are areas within your respective departments, and within your shop, Dr. Woteki, in which things are not working as well and smooth as was intended.

And here you responded, Dr. Horn, that things are moving relatively good, but there has not been complete satisfaction with the process to date. That's what gets my curiosity up. What did you mean by that?

Mr. Horn. Well, specifically what I meant by that is it's incumbent upon the action agency to indicate their priorities and assimilate the results of our research into their regulatory and policy-setting procedures. We serve the Department in that regard, and we find ourselves negotiating the objective results of research against all of the other issues that face the industry and the action agency. And this is a normal state of affairs, I suppose.

I would extend my comments, though, to outside the Agency as well, and I would also answer from the perspective of someone who spent 1 year working across all of the agencies. I would say that our interactions with the partners in the extension and university research communities are much improved since the reorganization as well.

You asked that question earlier, and I think that the reorganization highlighted the need for us to communicate better, to make absolutely sure we didn't have redundancies, and to put more energy into these negotiations to see that research did come through. You wrote a letter some time back indicating the intent of the Congress to have all research nested in this mission area.

And I think that was a very important letter to us, and it has been very useful to us. It separates research and the perception of objectivity, the reality of objectivity from the regulatory process, and that has been very helpful to USDA. And so I think there are going to be these kinds of negotiations inside and outside the Department, but I also get the impression that the intensity of those discussions is greater now than it was before reorganization. And I think the outcome is better.

Mr. Stenholm. Mr. Gunderson is still here. I would hope in the next couple of months that we're going to see the new and improved Food Safety, and Inspection Service. I hope we are going to see, from the Food Safety Under Secretary, a recommendation for a new Food Safety, and Inspection Service. That is my sincere hope.

It is years overdue. The frustration level that all of our industry is reaching, whether it's red meat, poultry, aquaculture, et cetera, is getting to the unbearable level. And the reasoning, the logic behind non-action escapes me today.

Mr. HORN. Well, some of the technology, in fact, does not exist, and there are researchable problems that go along with this. We have a $7,500,000 increase in the fiscal year 1997 request that is dedicated entirely towards the microbiology of food safety. And that would be directly applied to the problems that are researchable and a part of this mix.

If all of that was on the shelf, I suspect FSIS's job would be easier. But it is not all on the shelf, and I think that the key is to do something reasonable to get started and then continue to work, conduct the research that is necessary to fill in the gaps.

Mr. STENHOLM. I couldn't agree more.

Mr. Chairman, I will take another round in a moment. Let others go.

Mr. ALLARD. Anybody else have any questions? Mr. Crapo and then Mr. Smith.

Mr. CRAPO. Just very briefly. Thank you, Mr. Chairman.

Dr. Woteki, I wanted to follow up on the line of questioning that Mr. Lewis began when he was here with respect to precision agriculture. As you I'm sure are aware, that's an issue in which I am very interested to see us make progress, and I think holds the potential for some dramatic increases in our productivity and success in American agriculture.

And I would just like to get your opinion in general with regard to whether you agree with that assessment, and, secondly, what you think might be the best way for us to accomplish an increase in the focus of federally supported research in this area.

Ms. WOTEKI. Well, like many technologies that are in the very early stages, precision agriculture does show a lot of promise. It is also an area in which there clearly is a role for the Federal Government in the support of research, and to a certain extent in developmental activities, and there is also a very large role for the private sector to play.

Within the Federal research community, there is a Federal laboratory consortium that has played a role, that involves NASA laboratories as well as ARS laboratories, Department of Commerce, and others.

Mr. CRAPO. Department of Energy.

Ms. WOTEKI. Department of Energy as well, yes, in the research and pre-competitive developmental research activities. So it's an area that I believe has got an enormous amount of promise, and in which also that there is a very significant role for the private sector to play.

Dr. Horn might want to elaborate on that a bit.

Mr. HORN. I think another thing that might be useful to bring up here is that there are a number of agreements that are being generated between the Department of Agriculture and others that involve in some of the sophisticated, physical, and sensing sciences.

And, in particular, I would point to the ARS/Department of Energy agreements that form the basis for a memorandum of understanding between the USDA and Department of Energy. In November of 1995, Secretaries Glickman and O'Leary signed off on this, and this had led to a number of joint conferences and a number of joint activities that are intended to solve some of the problems of agriculture with previously unavailable technologies.

The Idaho Forum for Agriculture Research was held in Boise in February of 1996, and the Idaho National Energy Lab was a major player in that—University of Idaho, industry representatives, congressional staffers, and others, and ARS was present. I think this is one of the joint ventures that is extremely appropriate in a time when we are reinventing Government and looking for ways to contribute to——

Ms. WOTEKI. Dr. Robinson—excuse me, Dr. Horn. Dr. Robinson I think would also like to comment.

Mr. ROBINSON. Mr. Crapo, it is a really interesting question, and I have been sitting here during the process of the precision farming and trying to reflect on the contribution of different partners in the process. And perhaps my naivete is showing through, but precision farming is something we've been doing for a long time.

The technology to do it is improving, and it is really a systems approach, from testing soils that began years and years ago to being able to pinpoint with a geosystem computer-generated scanning device a particular point in the field and relate that, I think, is what is new to the process.

And I think perhaps Dr. Horn really hit on the last issue. Given that it's a systems process, I think there are many contributors to it. And often times when one may go to a particular demonstration, it doesn't come through as clearly those many contributors.

For example, the land grant system and CSREES is working, for example, with some of the new scientists at the Idaho DOE Lab, and in that case looking specifically at just the linking between soil and water and input use, and are using a sensing system that is available to them there. And all of these pieces ultimately begin to fit together in this broader system, and to me that's the new view.

How do we, in fact, implement all of these things that have been coming off of the technology drawing board for years in an integrated system that allows us to meet a whole series of goals on productivity, input use, protection of the environment, the whole 9 yards that goes with putting all of these technologies that have been developed on board.

Mr. CRAPO. I appreciate these comments, and I want to get one last question in. First of all, let me say I appreciate the support that I pick up from your comments. Am I correct that there should be a way in the Fund for Rural America for us to find a way for the USDA to significantly increase its support and participation in all of these types of efforts?

Ms. WOTEKI. To the extent that proposals are forthcoming that combine precision agriculture and meet one of the eight uses, I think certainly that they would be fundable.

Mr. CRAPO. All right. Thank you very much. I see my time has run out.

Mr. ALLARD. Mr. Smith?

Mr. SMITH. Just to expand a little bit on remote sensing, in Section 892, we put language in the FAIR Act that said there should be cooperation between NASA and the Department of Agriculture in remote sensing to better estimate supply and demand.

It seems appropriate that in this environment where ultimately farmers are going to be expected to make the decisions on how much of what crop to plant that USDA should very seriously consider trying to get all available information to those farmers. The available information is very sophisticated in USDA in estimating the potential supply and demand.

It seems to me that—and maybe there is, and I guess my question is, what is USDA doing in terms of looking at research efforts to better inform the farmers of more information, as the Federal Government and USDA stops in the traditional programs of telling farmers how much of what crops to plant? Or making that suggestion through our foreign program participation at least, and making that information available to farmers.

This particular section, in cooperating with NASA, is making better use of the multi-spectrum color and the radar imaging that we've been doing for approximately the last 35 years that now gives us the capability of predicting crop yields 60 days before harvest, with a plus or minus 15 percent accuracy. That kind of information can be just of unmeasurable value in helping farmers make the decisions of what crops to plant, especially as we come further north in this country.

And so if you would react to the implementation of that section, Dr. Horn, if you've looked at it.

And the other question I guess I would have is what is USDA doing in terms of that kind of research to better facilitate farmers in their efforts to take over the function of making not only the decision of how much of what crop to plant but also the language we included in the FAIR Act on farmers better utilizing marketing tools to do a better job of marketing.

Ms. WOTEKI. That's a whole pile of questions.

Mr. SMITH. Well, pretty much. Is the Section 892 and helping farmers get better information on supply and demand and——

Ms. WOTEKI. Yes. Well, let me make a couple of initial comments, and then I'll ask both Dr. Horn and perhaps even Dr. Robinson to comment on this. We are currently within the Department using remote sensing technology in our agricultural surveys. We use it as far as the design of the surveys, and it has definitely been——

Mr. SMITH. But I'm talking about estimating supply of commodities, rather than the accountability of simply—my impression is you're using it now to determine how much compliance is—were you then, or am I interrupting something else you are trying to say?

Ms. WOTEKI. Well, through the survey process, we're using remote sensing in various ways. Currently, it is being used quite a bit as far as the actual sample design for those surveys that provide us with estimates of supply. And also, it is helpful in doing some rapid estimates of when there are natural disasters and how far the damage is with respect to crop land.

So, immediately, remote sensing is now having quite extensive and far-reaching impacts on our——

Mr. SMITH. Okay. My narrow focus is better informing farmers of their new responsibility of supply and demand.

Ms. WOTEKI. Now, at that point, we are more in a research mode, and there is a terrific videotape that essentially summarizes some of the work that is ongoing within ARS that will help to provide farmers with the actual instrumentation and techniques and information to better help them make those kinds of decisions that they need to make on the farm. That's the kind of thing that I think Dr. Horn should address for you.

Mr. HORN. We are collaborating with NASA at Beltsville, MD, and Weslaco, TX, on remote sensing technologies. Our principal responsibility is providing the ground truth data on yields, and we are also providing technology support within the USDA to support NASS, the National Agriculture Statistics Service, and the Foreign Agricultural Service, on domestic and international crop surveys. So we provide the technical support, the ground truth data, to make that system of projecting crop yields work.

Ms. WOTEKI. And then, I think the other part of your question, though, is, how can information be better supplied to farmers? And that's where extension education and other less formal education approaches enter in, and Dr. Robinson will address that.

Mr. ROBINSON. Just very briefly, Mr. Smith. Your question that you were honing in on is, how do we take all of this information and ultimately get it to the farmer who has to make decisions? And there are a series of extension programming efforts underway, and I think the link within the land grant system and with ARS permits us to have a better link from the extension education program all the way through the research infrastructure.

Specifically, to the marketing tool question that you had, there are efforts underway now under the rubric of managing change within the extension community that is addressed—parts of that at least are addressed to specific issues on how do farmers begin to incorporate marketing tools and other tools to deal with a changing and uncertain environment—from a technology point of view, from a changing market point of view and from a Government program point of view.

Mr. ALLARD. Is the gentleman finished?

We have covered a lot of areas, and one area that we haven't gotten into. The committee had a questionnaire out that recognized that there was cooperation between extension, industry, and the research from land grant universities. But they seemed to indicate that they wanted an increased collaborative effort between USDA and land grant universities and industry sciences.

And one of those areas that was brought out was the—what incentives, for example, are in place to encourage the development of centers of excellence, where we have industry and land grant universities come together in a collaborative effort? Would you want to address that question? And then, I'd be willing to call on the gentleman from Texas for a follow up.

Ms. WOTEKI. I think there are a variety of ways to approach the development of centers of excellence. Certainly, to the extent that our regional research programs, sponsored through the CSREES and in which land grant universities participate extensively, those regional research programs begin to develop centers for excellence around problems that are shared in those regions.

There are a variety of mechanisms that could be put in place that would further encourage land grant universities to jointly plan to meet the needs of their regions and to allocate their resources, and we'll certainly be looking to our new advisory board, as well as to other organizations, like the National Academy of Sciences. You'll be hearing from a representative from the Board on Agriculture on one of their studies that is also recommending moving in that direction and provides some ideas about incentives that could be used to do that.

Perhaps Dr. Robinson would like to elaborate as well.

Mr. ROBINSON. The center of excellence idea has ebbed and flowed over the last several years, and it begins to be increasingly more on the screen as funds get tighter and issues get increasingly complex.

And just to extend the remarks that Dr. Woteki made in a couple of different directions, No. 1 if we are looking to centers of excellence and looking for ways to stimulate them, the tools that we have to identify those and stimulate them specifically are a bit dull.

If, on the other hand, we are looking to stimulate the best science addressed to the problems, we still have a number of tools couched in the NRI, and in other competitive grant situations, which many universities, for example, are beginning to establish a center in particular areas. That is a very high technology or very costly enterprise.

There is a specific kind of instrument available to ARS, and perhaps Dr. Horn would like to talk to this issue, on encouraging collaborative work between the private and public sectors. There are a lot of private-public sector partnerships that are developed at the local land grant universities, to try to fund specific work.

But, again, the bringing together of many of these different kinds of activities into *X* number of specific centers of excellence in certain areas is not something that we have in place currently.

Mr. ALLARD. Dr. Horn, did you want to add any more to those comments?

Mr. HORN. I'm not sure it's directly appropriate to centers of excellence, but we have the cooperative research and development agreement, of which 600 or so exist between ARS scientists and private sector scientists, and many of these are intended to commercialize and effectively transfer technology. And they do result in excellence that finds its way to the marketplace, but that would be the principal difference.

I don't think that it's a center of excellence in the sense of the land grant universities and the private sector necessarily.

Mr. ALLARD. Thank you.

The gentleman from Texas.

Mr. STENHOLM. Dr. Robinson, in the reorganization question, there was a lot of concern from our State and land grant universities as to whether or not, in the reorganized USDA, their opinions would be recognized, preserved, and paid attention to. What is happening in that area? I believe that it is working as intended, or are there any rough spots there?

Mr. ROBINSON. Well, Mr. Stenholm, it's like any marriage. It takes a little while to iron out some of the wrinkles, and we are in the process of doing that.

There was an anticipated huge culture shock in the combination of the old CSRS, the research arm, with the Extension Service. Quite frankly, the culture shock is not nearly as large as was anticipated for a number of different reasons.

One is a strong effort internally to look at what people had been talking about for some time, and that is the need to integrate both the extension function and the research function in many levels, in order to ensure that we, one, get a feedback loop that is appropriate between extension and research and, on the other hand, between research and extension.

A second effort that has helped tremendously, I think, is the collaboration that has occurred between the committee structure that represents research and extension. For example, the Extension Committee on Organization and Policy of NASULGC and the Experiment Station Committee on Organization and Policy have been collaborating more to try to get common goals, where common goals are appropriate, and separate goals where appropriate, to ensure that there is the kind of cooperation that engenders an integrated approach to problem solving as opposed to two different agenda proceeding at a time when complexity suggests that we must integrate many of these activities.

I think it is going better than I, for example, personally would have anticipated. There are still some rough spots. It means very often in my office that I am hearing from the research side and the extension side of the House, and they are not always together, and we try to find ways to make sure that people get together and iron out those differences.

Mr. STENHOLM. Mr. Chairman, I hope that if there are others that have differing opinions than what is expressed by Dr. Robinson that they might let you and this committee know, because I think this is key to the kind of working relationships that we need to have.

Let me just in my final statement, perhaps, Mr. Chairman, for your and other committee members' reaction, as well as the panel. But regarding the Fund for Rural America, and the one-third set-aside for research, and then the other one-third that is open for competitive bidding from all shapes and forms, I like that concept very much.

My regret is that there wasn't a little bit more money in this area, particularly in the research area, because I think the needs are there. In the food safety question alone, I think we've got some crying needs that need to be looked at, but we understand resources.

But my sort of understanding of this—I'm not nearly as worried about whether or not the advisory committee is appointed this month, next month, what have you. The monies cannot be spent until the next fiscal year—October 1—all of the development that has to go into this.

I hope the Department is moving expeditiously with your recommendations, and I hope you would bring them back to this committee. I would like to hear as soon as you have some ideas developed that you would notify the Chairman and that we would have another round, either publicly or privately, regarding directions or concern, but to answer some of the concerns that we all have, but I would like it to be public.

If we get down to specifically talking about priorities and where we might be going, and the sooner the better it be public.

And then, this committee has primary oversight. Advisory boards are nice. They are great. In fact, they are absolutely indispensable to our process. But this committee is the ultimate advisory board or ssister making various decisions. And that's the kind of relationship that I would like to see us pursuing.

So I would hope that you're developing your ideas, and that as soon as you can you bring them to this committee for public examination. And I hope the advisory committee is appointed post haste. But when I look at the language of how we're going to have these 30, you know, I am very disappointed there is not a Swedish Lutheran farmer from Texas required on this 30-man board, because somebody is discriminating right there in it. But I understand the difficulties of meeting the other law that you were referring to that we have to consider. It's going to be done. It will be done. It will be a very, very valuable board, because it replaces three other advisory committees.

And it is going to be extremely important for the purposes of determining priorities and making certain that these funds are spent for the priorities that are the most important to production agriculture, whether it be in the area of crop reporting, as Mr. Smith was talking about, something awfully important in this new market-oriented agriculture, or particularly in the area of food safety.

I think we have some very critical needs that the sooner we can have some idea of how we can resolve it—and not only with this subcommittee but also Mr. Gunderson's subcommittee, in the area of food safety. There are some real critical needs, and I hope we don't have to wait until we get all of our ducks in a row before we at least start talking about it.

Mr. ALLARD. Well, I'd just say to the gentleman, I'm from Colorado. I'm disappointed that we didn't have a requirement in there that the members of the advisory board had to come in from an altitude over 5,000 feet above sea level. [Laughter.]

Mr. ALLARD. But not me. The gentlelady from Idaho came in late. We're in the process of wrapping up this panel. I want to give you an opportunity to ask some questions if you'd like.

Mrs. CHENOWETH. Thank you, Mr. Chairman, I appreciate that. I didn't hear their testimony. I have studied it, but I would just as soon proceed to the other panel. And I appreciate your good testimony.

Mr. ALLARD. Thank you, and I want to thank the panel. And we'll move ahead with the second panel. At this time, we'd be please to welcome our second panel to the table. Our witnesses are Dr. Bob Zimbelman, who is chairman of the Coalition on Funding Agriculture Research Mission; Dr. Vic Lechtenberg, who is president of the Council for Agriculture Science Technology; and Dr.

Robert Helgesen, who is chairman of the National Association of State Universities and Land Grant Colleges, Board on Agriculture.

Dr. Elizabeth Owens is representing the National Research Council, Board on Agriculture; Dr. Paul Rasmussen is chairman of the Experiment Station Committee on Organization and Policy; and Dr. Joseph Coffey is the chairman of the Council for Agriculture Research Extension and Teaching.

Dr. Zimbelman, you may begin when you're ready.

STATEMENT OF BOB ZIMBELMAN, CHAIRMAN, COALITION ON FUNDING AGRICULTURAL RESEARCH MISSIONS

Mr. ZIMBELMAN. Thank you, Mr. Chairman. I'm pleased today to be present for my colleagues on CoFARM, which is a coalition of professional organizations involved in extension teaching and research. Many of our members are members of academia, but some are also involved in industry as employees or consultants.

In addition to plant and animal organizations, we also have folks from agriculture, engineering, social science areas, such as rural sociology, agricultural economics as well as food processing. Agriculture research, as all of you know, is important to a well fed military to use high tech weapons and to provide food for proper nutrients to prevent disease, to maintain health and a long life consistency and has the greatest impact on the natural resource of soil and water of any of our human activities.

Therefore, it should be of interest to more than the Agriculture Committee, and I'm sure that many of those people to whom it is of interest do not really recognize that fact. But our past agriculture research has been an investment that's contributed to a lot of success.

Those gains were made over the years through a primary focus on production efficiency. Today we need to broaden that agenda. We need to do this while we maintain the focus on production efficiency to allow us to be competitive on an international basis. But we also need to add consumer needs and societal issues relating to food quality, safety, convenience, cost, and other factors.

And this kind of challenge of expanding the agenda requires that we give it very serious attention. How did we achieve the past? We achieved it through a mix, as others have said this morning, of the Federal in house research, formula funds, competitive and special grants.

The research agenda was a continuum from the basic research—that is, understanding biology, chemistry and physics— and the application to solving agricultural problems and challenges. Then this information was passed on to the extension service, which got it to the producers.

This model, I think, is the envy of the world today. Maybe the balance hasn't met today's standards and isn't perfect, but I think the general system has been very successful. Since we've been so successful, can we not just rest on our laurels and look elsewhere?

I think probably not. The integration of knowledge to allow producers to remain competitive and adjust to changing consumer needs is a key element. Private industry does not have the means to put together such an integrated program, nor the incentive. So we, on a Federal level, must put together this integrated program in a way as never before in history. This is probably a role that can be fulfilled, as was indicated by the previous panel, by the Fund for Rural America.

The ARS provides in house research and is committed to meeting the science needs of USDA such as FSIS and APHIS. This is an important role and should continue. ARS probably could use a greater share of its funds for grants and contracts to allow it the flexibility to meet this role. It does not always have all of the disciplines needed to provide the needs of these agencies.

Competitive grants is the area which should become a greater part of the portfolio since they allow the greatest flexibility and assure that programs measure up to some kind of scientific and merit review.

The USDA competitive grants program is by far the smallest in both dollars and percent of portfolio of any Federal agency that supports research. Special grants will always be necessary to meet certain needs such as minor crops or animal species, minor uses, et cetera. To the extent possible, these special grant funds should be awarded on a competitive basis, which first evaluates relevance to the problem; and second then, to peer judgements as to whether this will add information to helping understand or solve that problem.

Now that we have defended all of the current components of the program, does that mean everything should be the same? Not necessarily. We would pose that the proper balance depends on what the goals are. And we support the idea of a stakeholder's advisory board that should be empowered to provide such direction.

We propose in addition a series of satellite groups which would help with this process. Satellite groups of 100 to 300 persons could meet on specific areas such as animal systems, such as plant and soil systems, such as processing and food safety, such as societal and consumer concerns.

These folks could then bring back this information to the advisory board to make sure that it represents a broader consensus than individuals might do. Producers and consumers should be there to present their needs and desire, and scientists should be involved to explain how scientific goals and priorities could be formulated so as to contribute to desired solutions. I think the USDA role in this process could be to encourage these satellite meetings and see that their results are considered as they—come back through the stakeholder's advisory group.

So in summary, in the interim, we suggest that the competitive grants program be enhanced while maintaining level funding of base programs.

For intramural research, certain functions and flexibility may need to be strengthened while some locations or programs without critical mass should be seriously reassessed relative to the goals and priorities of REE overall.

The first stage question should be how it fits the program and the goals. It's also important that the Under Secretary of REE ensure that administrators of agencies work together and be realistic about the capabilities of each to play the most complementary role possible in advancing the overall national agenda.

In other words, change should be evolutionary, not revolutionary. Past success doesn't justify continued funding. At the same time, we should not jeopardize a system that has been successful because too much is at stake. CoFARM recently put out a new brochure, and I think you have a copy. If not, we'll be glad to get those to this committee. And we appreciate your time this morning.

Mr. ALLARD. Thank you, Dr. Zimbelman. Dr. Lechtenberg, please.

STATEMENT OF VIC LECHTENBERG, PRESIDENT, COUNCIL FOR AGRICULTURAL SCIENCE AND TECHNOLOGY

Mr. LECHTENBERG. Good morning, Mr. Chairman and members of the subcommittee. As you indicated, my name is Vic Lechtenberg, and I'm here today representing the Council for Agricultural Science and Technology, CAST. I currently serve as president of CAST. The CAST mission is to identify agricultural issues and to interpret the relevant scientific research information to aid public policy decision making. Thus, CAST has a keen interest in the Nation's agricultural research system. My role in CAST is as a volunteer officer. I'm also Dean of Agriculture at Purdue University.

The agriculture research, extension and education system is important—very important to the long term competitiveness of the food and agriculture industry in this country.

And as we look to the future, I see two critical questions that I gather from the conversation earlier, this committee is certainly trying to address. The first is, what is the proper size of the agricultural research extension and education system that's needed to assure that we have a competitive position in this important industry?

And second, what's the proper role and balance between the Federal, State and private performers of our research extension and education system? Let me, if I might, address the quantity or the size question first. I'd like to make a case that we currently have an undersized system relative to the importance of this sector to the Nation's economy.

The economic contribution of the agriculture and food system is commonly estimated at 15 to 18 percent of the Nation's domestic economic output. Federal research that backstops this sector is about 3 percent of the total Federal R&D.

If one adds all of the other public non-Federal research and development funds as well as the private funds, then that percentage grows somewhat to about 4 percent of all R&D. By either assessment, investment in agricultural research and education is low relative to the economic value of this sector.

And I couldn't agree more with the comment that Congressman Crapo made in his opening statement that the economic studies certainly show high rates of return on investments in agricultural research and education.

There's another dimension to the size question that I think is important. Certainly it is important to CAST. And this addresses the breadth of expertise question. As CAST prepares reports and papers, we draw on the scientific expertise of individual scientists, many of whom are employed by universities, by USDA, and by the private sector. If the aggregate size of the research system is reduced significantly, key areas of expertise will be lost. Now, this has already happened in some areas as many public institutions have decreased the size of their research and education system in the last 4 or 5 years.

The second key question in my mind is that of the appropriate role for Federal funds in research extension and education. In my view, there are three critical elements to a successful R&D system for the industry. One is that of basic research to better understand our physical and biological principles that undergird our modern production and processing systems. Second, we must have a mechanism that solves key problems by adaptive research and extension education. And third, it's absolutely essential that we have a highly educated and well trained system for generating human resources. I think there is an important role for Federal funds in each of these areas for at least four reasons.

First, I believe that the United States should be a world leader in developing basic fundamental knowledge on which to anchor the practical and cost competitive agricultural systems of the next century. This should be a national priority, and I think merits Federal funds. The USDA should assure that its funds for basic research both internally and through grant programs are used in a manner that complements the basic science programs of other Federal agencies.

Second, I think our agricultural policy should also include a mission to assure that the Nation has the best educated and the best trained human resources in the world. Our land grant universities are recognized around the world for their excellence in this regard. This excellence has been achieved through a carefully tuned balance between research and education and teaching. Each of these enhances the other. The excellence of this system is a tribute to the wisdom and the leadership of the Congress in creating and nurturing this system over the past decades. I think it is extremely important that we retain this preeminent position in our human resource development capacity.

A third reason I believe Federal funds are important is because a significant portion of the research that's carried out in universities and USDA produces benefits that accrue well beyond state boundaries. It's unreasonable to expect the State to provide the optimum level of funding when many of the pay offs will be beyond the State borders. Federal funds and USDA involvement are important to help leverage state funds and to assure the coordination and cooperation among state performers.

And last, some argue that research and education in agriculture can be privatized. Doing so completely would, in my view, alter the outcome of the research program significantly. Goals of private sector research are driven by short term goals of generating a profit from the sale of goods and services. Public sector research is not so constrained and can lead to technologies that may actually reduce levels of certain commercial products and services. Research of that nature is not likely to be undertaken by the private sector. Also, public sector research is also openly available and readily accessable to the public, as was noted earlier.

So Mr. Chairman, as members of the subcommittee deliberate the future of the agricultural research system, I hope that you will carefully consider the positive impact that this system has had on the competitiveness of American agriculture and food system.

Even with current budget pressures, we must do all that we can to be certain that U.S. farmers and producers continue to enjoy world leading technology. I and other members of CAST will be pleased to work with the subcommittee in any way that we can as you try to strengthen the Nation's agricultural research, extension and education system.

Thank you for the opportunity to make these comments.

Mr. ALLARD. Thank you, Doctor. Dr. Helgesen?

STATEMENT OF ROBERT G. HELGESEN, CHAIRMAN, BOARD ON AGRICULTURE, NATIONAL ASSOCIATION OF STATE UNIVERSITIES AND LAND GRANT COLLEGES

Mr. HELGESEN. Thank you, Mr. Chairman. I'm Robert Helgesen, Dean of the College of Food and Natural Resources at the University of Massachusetts. I'm here testifying in my capacity as Chair of the Board on Agriculture of the National Association of State Universities and Land Grant Colleges, NASULGC.

I'm here to speak about the partnerships within the land grant system that make it such a powerful agricultural research, extension and education network recognizing, of course, that ARS and Agribusiness are critical partners in the system.

Congress created that network by passing three key acts, the Moral Act of 1862, which established the land grant colleges; the Hatch Act of 1887, which established the State Agricultural Experiment stations; and the Smith-Lever Act of 1914, which established the State Cooperative Extension Services.

The system was enhanced by adding 17 predominantly black colleges in 1890 and 29 Native American colleges in 1994. What you have created is a vast knowledge network upon which we build our agriculture. Congress guaranteed a State partnership in this network by requiring the states to share in the investment.

Because they place a high priority on agriculture, today most states far exceed the federally required dollar for dollar match of Federal formula based funding for experiment stations and cooperative extension. The unique balance you appropriate—the unique balance between formula based funding and competitive based funding that you appropriate along with your state partners allows us to focus on local and national priorities simultaneously, while at the same time assuring high quality and highly productive programs.

The partnership between the State and Federal partners is facilitated by the USDA Cooperative States Research, Education and Extension Service, or CSREES, which brings together in one continuum State and Federal programs that create new knowledge and new technology for agriculture and that extend that new technology to our classrooms and to our stakeholders.

In addition to making sure that all our projects meet minimum Federal guidelines, CSREES facilitates the setting of national priorities and the communication within the network. Presently, CSREES is proposing a sophisticated reporting system which states will be able to comply with the 1993 Government Performance and Results Act, while at the same time providing much better communication between the State partners.

We're hopeful that CSREES will have the means to actually develop that reporting system. In a certain sense, CSREES is the glue that holds our network together. NASULGC is another way in which the partnership is coordinated at the national level. It's organized into councils, commissions and boards.

The Board on Agriculture has five sections—the experiment station section; the extension section; academic programs section; international agriculture section; and the administration heads section, or the dean's group; as well as the Council on Agriculture Research Extension and Teaching, which is known as CARET.

CARET is made up of stakeholders from each State who advocate for the land grant system. The board's annual budget planning process where national priority is set out for all activities is a good example of national integration. Dr. Charles Browning, Dean at Oklahoma State University, who testified before the House Committee on Appropriations earlier this year, chaired the fiscal year 1997 budget planning committee of NASULGC that included representatives from CARET and the five board sections.

The current NASULGC Joint Futuring Activity is another partnership example. Through a national scoping conference and regional listening sessions with stakeholders, Dr. James Fisher, director of the South Carolina experiment station, and Dr. Zerle Carpenter, director of the Texas Agricultural Extension Service, cochair an effort to determine what our stakeholders value and what they would like changed in our system to help us chart a course for the next century.

The Joint Futuring Activity is reported regularly on the World Wide Web for those of you who have access. There is a regional organization of experiment stations and extension services that focus on regional priorities in the northeast, north central, western and southern regions.

The trend in all of these regions is toward a closer integration of research and extension. In the northeast, for example, we have recently established northeast research extension committees, or NEREC's, to help us integrate between these two activities.

This morning, Dr. Rasmussen will provide more detail on state experiment station issues. And in June, Dr. Lery Luft, director of the Idaho Cooperation Extension Service, will provide more detail about cooperative extension issues.

It's this agricultural knowledge network through national, regional and local efforts that explains why, for example, we have been so successful in the development of complex programs such as integrated pest management and water quality for our major commodities and regions.

On behalf of the Board on Agriculture, I want to express our appreciation for the investments you have made in this knowledge network, and we look forward to working with you as partners in determining the national agenda that is best suited for our agriculture.

Thank you.

Mr. ALLARD. Thank you, Dr. Helgesen. Dr. Owens.

STATEMENT OF ELIZABETH OWENS, ON BEHALF OF THE NATIONAL RESEARCH COUNCIL, BOARD ON AGRICULTURE

Ms. OWENS. Mr. Chairman and members of the subcommittee, my name is Elizabeth Owens. I'm honored to be here this morning to discuss the National Research Council's new report, Colleges of Agriculture at the Land Grant Universities: Public Service and Public Policy.

You had a pre-publication copy of the report delivered to your office yesterday. Your hearing is our first opportunity to publicly discuss the report's findings and recommendations. It's a most welcome and appropriate opportunity.

I want to bring greetings from former Wisconsin Governor Anthony Earl, who chaired the committee and who was unfortunately unable to be here this morning. He asked that I extend his apologies for his unavoidable absence. It's a great honor for me to represent the members of this outstanding committee before you today.

As a granddaughter of an Idaho pioneer and the daughter of a director of an agriculture experiment station and research center, I am deeply committed to the continuation of a strong agriculture in this country. I am proud of my agricultural roots, and I am also proud to say that the Committee on the Future of Land Grant Colleges of Agriculture feels that the colleges have a key role to play in the future of agriculture.

The 21 member committee I represent is composed of representatives of the land grant system, the agribusiness industry, public interest groups, state government, and the non-agricultural science community. We all served as volunteers. The names are listed in the attachments to my testimony.

We studied the adaptation of land grant colleges of agriculture to the dramatic changes in society and agriculture and in science. Before I move onto the substance of my presentation, let me briefly describe what the National Research Council is and how it works.

I do this because it is important for an understanding of the value of our recommendations. The National Academy of Sciences was established to provide independent advice to the government on matters of science and technology. It does so through the NRC.

It uses thousands of experts from academia, industry and other organizations who volunteer their time. The NRC strives for a balance of reviews and views among committee members and subjects them to a conflict of interest review. The normal product is an independent consensus report.

The committee's work is subject to oversight by supervisory boards and commissions within the NRC and review by outside anonymous experts who did not serve on the study committee. The sponsoring Federal agencies have no role in this process and do not see the report until it is ready for public release.

The committee's work encompassed three stages. I don't have time to go into the details, but I do want to tell you that our first stage resulted in a descriptive publication, Colleges of Agriculture at the Land Grant Universities, a Profile; which was publicly released last September.

To me, the most interesting part of our deliberations was the second stage when we made site visits to hold forums in five different states. There were more than 500 individuals who participated in these forums. A few of the highlights that touched my soul at two of the forums were the number of ranchers and farmers that came out in the Blizzard of 1995 in South Dakota.

We were trapped by 21 inches of blowing and drifting snow, yet some of these hardy souls who were also in the midst of calving operations still found time to talk to the committee about what programs at South Dakota State University meant to them. There was also a very remarkable group who traveled from the boot–heel of southern Missouri to tell the committee how extension services associated with Lincoln University were helping them to establish youth programs in their small community.

I also remember the eloquent statement by a Missouri farmer who asked that we not forget that most family farms are operated by part time farmers and that they deserve our support in terms of the development of business opportunities in rural communities.

In the last phase, we reached our conclusions. I ask that you look at our testimony today and at this report for some of the details of those conclusions. The committee's first major conclusion is that the land grant model is as relevant to the needs of contemporary society and today's food and agricultural system as it was in 1862 when almost 50 percent of all U.S. citizens lived on farms.

Today, just as yesterday, excellent research programs should be linked to societal needs through a public service function we call extension. And extension should be a cooperative partnership among Federal, State, and local governments.

Being good doesn't mean there's no room for change. In fact, to stay on top, colleges need to strive to stay relevant, to find new ways to address the challenges and opportunities of the new agriculture, to embrace the food system and all that it entails, and to serve a broadened constituency. The land grant system must realize efficiencies in the organization of teaching, research and extension, particularly to reflect the regional and multi-state characteristics of many food and agriculture programs. The colleges must reinvigorate the linkages and the synergy among teaching, research, and extension, while enhancing accountability and quality.

Our committee developed 20 recommendations to support these key themes. I would like to tell you a couple of them. The committee recommends that in setting research priorities that land grant colleges garner regular and effective input from a broad crosscut of citizens.

Furthermore, the committee recommends that Federal funds be used to strengthen the tripartite mission of teaching research, and extension and to address the needs of disciplinary teams. We recommend that these funds for research and extension be combined into a single allocation to do this.

I appreciate the chance to make these comments and I thank you for your time.

Mr. ALLARD. Thank you, Dr. Owens. Dr. Rasmussen?

STATEMENT OF H. PAUL RASMUSSEN, CHAIRMAN, EXPERIMENT STATION COMMITTEE ON ORGANIZATION AND POLICY

Mr. RASMUSSEN. Thank you, Mr. Chairman, members of the subcommittee. And thank you for the opportunity to speak to the important research issues being discussed today. My name is Paul Rasmussen. I'm the experiment station director at Utah State University, and I chair ESCOP, the Experiment Station Committee on Organization and Policy, which is a part of NASULGC, as has been mentioned before.

ESCOP represents the directors of the state agriculture experiment station. In testifying today on the one hand, I am particularly happy to do so because of the news that I do not have to report. Americans are not experiencing famine. They're not experiencing wide outbreaks of food borne diseases or enumerable other agricultural related problems that sap the economic vigor, political stability and social vitality of nations.

On the other hand, I am worried about the future of a system that has served us so well for so long. ESCOP had the opportunity to respond to the 57 questions submitted by the Agriculture Committee, and we appreciated the opportunity to participate in that survey.

I will not address those responses, as they are part of the record. I would mention that the experiment station directors are concerned about three primary things, namely coordination, priority setting, and accountability. We recognize that there are changes occurring in the internal and external environments.

The revision of Title XVI provides us an opportunity to recognize that "business as usual" is not the order of the day. "Research capacity" in nearly every State has been eroded by as much as 20 to 25 percent over the past 5 years. We've accommodated some of this reduction by a restructuring, but scarce resources jeopardize our ability to meet our goals.

We think that FAIR '96 can create needed change and preserve at the same time high priority programs. When we look at your balance budget initiative, we think it offers an opportunity to modify our programs to meet changing needs with limited resources.

We think that the research that comes from the experiment stations are a valid part of the new agenda for agriculture. We feel that it will provide improved planning and policies and that that improvement should build on the unique strengths and partnerships between the USDA and the State Agriculture Experiment Stations.

The university system is greatly influenced by local and State priorities. We use a "bottoms up" grass-roots approach. The Agriculture Research Service of the USDA on the other hand appropriately takes a more top down approach. There is some criticism that we don't adequately coordinate and collaborate between the two systems.

We think that there is collaboration. However, we agree that there should be better and more and welcome the opportunity of exploring with this committee ways to stimulate that cooperation. The client needs that we see at the States are changing. We think that the new farm programs will increase the demand for new technology and create new opportunities.

Our research agenda includes methods to reduce or avoid both economic and environmental risks. There are a number of examples of research activities that we are involved in that we must continue to address and to take back to the customers and clients that we represent.

We think that the farm bill should create an opportunity to set a general method of setting broad goals and priorities. We recommend that the farm bill provide general guidance for planning and for assessing output and impact. The bill, however, should not be excessively specific so that the partners can adequately address changing needs.

We recognize that with decreasing resources there will be a need to foster linkages with other agencies. The struggle will be to remain focused to address the problems of our clientele as our faculty members pursue other resources. I want to skip to a recommendation that we have with respect to accountability.

The recently passed 1996 FAIR Act includes language that directs the Secretary to develop a management information system to track and report research accomplishments. We encourage the Department to implement new computer based reporting systems for research and extension.

Some of our institutions are working with the department to develop an MIS. The system should include 6 components. First, the MIS should integrate into the USDA's activities of the Government Performance and Review Act.

Second, it should incorporate the CRIS system so that scientists can coordinate efforts and avoid duplication. Third, it should improve communication between research scientists, extension agent, state program administrators and administrators in Washington.

Fourth, it should allow the extension system to convey cutting edge research findings to the public. Such a system should also include problem identification from the field to the research scientist. Fifth, the MIS should be on a geographic information system for use in establishing priorities.

The southern region of the State Agriculture Experiment Station is developing a prototype system based on existing data bases and GIS systems that contain relevant agriculture information. They can overlay locations and research projects to better coordinate and integrate their state efforts.

And sixth, the MIS should estimate return on investments in research and development. This is a very difficult task. But Dr. Thayne Dutson, Dean of Agriculture at Oregon State University, has developed a computer based system showing the rates of return on research funding for Oregon.

If the committee is interested, we could demonstrate the Southern GIS MIS and the Oregon accountability system. In closing, Mr. Chairman, members of the committee, as with any system, there is room for improvement. And these improvements, when identified, are being implemented.

Nonetheless, there is a point at which a lack of resources demoralizes an organization. We are approaching that point today. We are not plagued by Mad Cow Disease, but there is potato blight, the Russian wheat aphid, jointed goat grass, karnal bunt disease and hundreds of other pressing concerns, many of which would not be addressed without Federal support.

We have in place a system that capitalizes on individual initiative, fosters cooperation among local, State and Federal agencies, and utilizes the tremendous infrastructure of our land grant institutions. We must not let crises dictate the allocation of funding.

Prevention is much, much more cost effective. We commend you for your efforts to examine and improve our Nation's agriculture research system. This is a critical issue not only for the research community, but for agriculture and the general public.

We look forward to working with you and the committee as you work through these challenging issues. I thank you for the opportunity to testify here today.

Mr. ALLARD. Thank you. Dr. Coffey?

STATEMENT OF JOSEPH D. COFFEY, CHAIRMAN, COUNCIL FOR AGRICULTURAL RESEARCH, EXTENSION AND TEACHING

Mr. COFFEY. Mr. Chairman, thank you very much. My name is Joe Coffey. I'm testifying on behalf of CARET, which is a volunteer national organization in support of the land grant universities. I serve as vice president of Southern States Cooperative. We sell feed and fertilizer and 45,000 other things to farmers. That alone says something for agriculture research.

I'm going to skip over my reasons why we should do agriculture research. The previous testimony has already laid that out well. Let me just simply say that I think the committee is doing important work. The current Business Week magazine talks about the new economics of food. And I think we need to talk about the new direction for research in the future.

And in that connection, I'm going to just give the bullet points from the recommendations that we have as a volunteer organization of lay people supporting agriculture research.

First, we think that you ought to make research not just a 2-year title in a farm bill, but a core component of our long term agricultural policy. There are only two ways for the American farmer to compete in this global market. One is to work at a lower wage than anybody else in the world, or to work smarter than anybody else in the world.

And we think we ought to work smarter than anybody else in the world. To do that, we've got to have research. Second, we think that you ought to strengthen the base programs of the land grant universities. We think they have tremendous advantages. And frankly, I'm not quite as enthusiastic about competitive grants.

I have some concerns about those. I think in reading Adam Smith and Peter Drucker both this week, I've convinced myself that there are reservations that a central organization is smart enough to identify all the problems out there. I think we need to have a better information system and encourage the researchers and have base funding.

While I think that the competitive grants have a lot of sizzle, I think the stake really is on these base programs so we have a base of knowledge on which to build. And certainly I think we need to strengthen the research and evaluation reward and incentive systems at the university.

And frankly, I get more invitations to testify before research hearings than I do credit card solicitations. And I think sometimes that we need to get on with investing in research and do less inquisitions.

The final point is that I think we need to invest our Federal funding in agriculture research and education programs. The fact is this. United States farmers this year will produce about $200 billion dollars worth of products. These products—the farmers share of the food dollar is 25 percent.

So this $200 billion is converted into $800 billion worth of food. And we're spending $1 billion worth of Federal agriculture research funds and extension funds for this $800 billion worth of stuff that we're producing out here.

That is a very, very small share. In fact, it's about one–tenth of 1 percent, to be exact. And so that's a very, very small investment. And every study that's ever been conducted shows a huge return. In fact, one of our major challenges is to convince people that these returns are legitimate and they're as high as they say they are.

So my bottom line is that I think we need to continue to support and strengthen the land grant university system, this unique system. It's our invention here in this country. And as you travel around the world, you'll see what a lot of other countries are trying to emulate but haven't yet figured out is our winning combination of research, extension and teaching.

Thank you.

Mr. ALLARD. Thank you, Dr. Coffey. I would just like to ask some general questions to the entire panel. You can all respond. And then I'll move on to my colleague from Idaho for questions.

What can we do to increase the communication between the USDA and the private sector and yourselves in this research effort so we have a better idea of who's doing what and what the results are or are you all happy with what's going on in the communication area?

Mr. ZIMBELMAN. I guess I could take a crack at that. I think the current research information system, CRIS system, that they indicated is being updated, is a real need. For example, I went in last week to ask for a question on animal growth, and it said there were no hits.

Then I tried the technical term somatotropin, and there were 52 hits. I would guess the producers or this committee or someone else might look at it more from the animal growth standpoint. So I think there's some failure to make the system really user friendly and reflective of input by producers and other lay persons.

Second, I think the universities probably need to encourage their reward system to reward that of their faculty members. Maybe there's not been enough of that in the past.

Our professional society, American Society of Animal Science, is looking at this too. Our journal is the No. 1 quoted journal in agriculture around the world. But it has very definite criteria for publication. And there are some interdisciplinary or integrated research programs that don't quite meet the criteria for statistical design.

So we're looking at alternative publications where teams of people could get together to do work and communicate this and get rewarded for it. So I think probably all components of the system need to look at this to both communicate better and to promote team and the multi-disciplinary approaches to agriculture research.

I hope that answers your question.

Mr. ALLARD. I liked your response and the language problem and the scientific terminology, whether you do a search under growth or somatotropin, whatever. And I think that may be hits pretty solidly at the problem with the producer/lay people trying to access this information.

Dr. Lechtenberg?

Mr. LECHTENBERG. Mr. Chairman, I would add just a bit to Dr. Zimbelman's comment. I think all of us in the academic institutions, particularly in our research organizations, need to work very hard to encourage our faculty and provide them a little more experience in using communication tools to better translate their scientific results into language that the public—particularly the general public and producers understands more clearly.

I think we're doing a better job of that, but we still have a long, long way to go in my view before we convey to the public the extensive enthusiasm and excitement that really is imbued in most of the research programs that we have going on in our institutions.

Mr. ALLARD. Any other comments from members on the committee? Okay, Dr. Rasmussen?

Mr. RASMUSSEN. Yes, thank you. I think that one of the major steps taken by Congress was the exemption or partial exemption of the partners from FACA. I think that was a very constructive action, and that eliminated a lot of unnecessary and inappropriate limitations in collaboration between the partners.

I also think that as a next step, it would be appropriate for the committee to develop legislative language to create clear mechanisms for the universities and the department to coordinate their respective budget research priorities and programs. So there could be instructions, we think, provided through the Secretary that will allow us to develop common strategic plans with common goals so far as they fit and still retain the flexibility that we need as they partner level.

Mr. ALLARD. Yes, Dr. Coffey?

Mr. COFFEY. I would just like to briefly comment on that. I think in the State of Virginia we have a good, close relationship with our land grant university. In fact, our top senior manager of our organization spent a day and a half on campus recently.

And we invite faculty members to our organization. So, I think we are communicating. And certainly the improved communications technology on the Internet I think is greatly expanding access of people like myself—lone researchers or lone economists in an organization back to accessing the information at the Federal Government as well as the universities.

Mr. ALLARD. Thank you. Let me call on my colleagues now from Idaho, Mrs. Chenoweth.

Mrs. CHENOWETH. Dr. Coffey, it was so interesting the way that Dr. Zimbelman spoke about the fact that he was looking for information under the subject of growth and he had to get into genototrophin to get what he really wanted. And so, since you are a producer, since you have waded into this, if you were designing yourself a new computer based management information system specifically other than meeting and bringing minds together specifically, what would you include in this to make it more user friendly?

Mr. COFFEY. The computer technology—I was interested in the Mad Cow Disease, so I went to Internet the other night and typed in three words, Mad Cow Disease. And it came up with 16 lists of items on the Internet that had the scientific articles and other articles that I could read being a mad economist, not a mad cow.

And my point is that—and the Digital Equipment Company has just announced a computer search algorithm that has the capability of sorting through 16 million pages and 60 billion words and find the information there. So information technology on the Internet as we speak today is getting to the point where you can type in Mad Cow—I can't pronounce bovine—I can't even—okay, I won't try it.

Mr. ALLARD. Bovine Spongiform Encephatopathy.

Mr. COFFEY. Thank you. I can't do that. But that's my point. Communications technology is here today. I think we ought to use it and not try to reinvent something else, but use that technology to—and get on with putting the substance on and not worry about the frills of indexing it and so forth.

Mrs. CHENOWETH. Dr. Coffey, you know, we really do understand the need to support long term basic research to make sure that we have the knowledge base to stay competitive and to solve tomorrow's problems. In the short term, we need to make sure that there is enough applied and developed within the research area to address today's problems.

As a producer, are you satisfied that your immediate short term problems are being addressed by research?

Mr. COFFEY. I guess no. I mean, we're always encountering problems that we would like additional information on. But certainly I am impressed that we have a core. That's why I support the core base programs of the land grant universities, the basic institutional support. Because I don't know tomorrow whether I'm going to be worried about mad cows or sudden syndrome in turkeys or what it is that I'm going to be addressing.

But I feel confident that I can get on the phone or get on the Internet and then get on the phone and begin to get to the people. So I feel that we have this core of competency. And then when we need additional information, of course, we provide grants to the university or joint projects on precision agriculture or whatever it might be to get into greater depth.

So no, we're always going to be asking questions because we want to be at the front of the frontier. But I am confident that the universities, at least in our case, are providing good support.

Mrs. CHENOWETH. Are you making sure that there are ways that the producers have adequate input into defining the applied research priorities?

Mr. COFFEY. Yes. I mean, of course of organization, which I chair, largely consists of producers or people in the business community such as myself. So we are heavily involved. I was a former member of the research committee of the land grant college system and served as chairman in that capacity.

So yes, I think we're being involved.

Mrs. CHENOWETH. Thank you. Dr. Rasmussen, I just have one quick question. You mentioned in your testimony that research capacity in nearly every State has eroded as much as 20 to 25 percent over the last 5 years. I was shocked by that. Why did that happen and how is it happening?

Mr. RASMUSSEN. Well, it's happening because of the amount of resources that are available to the States to distribute to the services that they need to provide. And it's going to other areas, as we've all experienced in our States.

And so, one of the ways to meet the demands placed on a state is to take the discretionary funds and apply them to those things that seem to have the highest priority in the society. And research often times is not one of those issues of high priority at the state level.

Mrs. CHENOWETH. Thank you. Thank you, Mr. Chairman.

Mr. ALLARD. Thank you. And I'd like to thank the panel for showing up and their testimony. And we appreciate your comments. I think they were very helpful.

Now to the third panel. I'd like to welcome you to the table. Joining us will be Dr. Barry Swanson who is representing the Institute of Food Technologists. Dr. Jerry Nelson representing the TriSocieties, which include the American Society of Agronomy, Crop Science Society of America, and the Soil Science Society of America.

And Dr. Jane Rissler will be testifying in place of Dr. Margaret Mellon with the Union of Concerned Scientists. And Dr. William Thompson is representing the American Society of Plant Physiologists. And finally, Dr. Peter Barry is the president of the Consortium of Social Science Associations.

Dr. Swanson, we'll have you begin if you would, please.

STATEMENT OF BARRY SWANSON, REPRESENTING THE INSTITUTE OF FOOD TECHNOLOGISTS

Mr. SWANSON. Thank you very much, Mr. Chairman. Good morning. My name is Barry Swanson. I'm a working research professor in the Department of Food Science and Human Nutrition at Washington State University. It's also a great pleasure this morning to testify before my representative, as I reside in Moscow, Idaho.

I'm also testifying as chairman of the Research Committee of the Institute of Food Technologists with the acronym IFT. The Institute of Food Technologists, is a scientific society of 28,000 food scientists and others working in related professions in academia, industry and government.

I appreciate this opportunity to represent the Institution of Food Technologists and present testimony on publicly funded—at least our perspectives of publicly funded food and agricultural research. We are disappointed in the fact that according to the National Academy or the General Accounting Office, only about 2 to 3 percent of America's Federal investment in research and development is directed toward agriculture.

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Such public investment obviously supports research that leads to understanding, detection and protection against emerging pathogens such as E-coli. Public investment in agriculture also helps solve the problems and gives us knowledge to prevent some of the plant-animal diseases that have come before us, such as karnal bunt fungi on wheat, late blight on potatoes, and as has been discussed, the Mad Cow Disease.

Federal investment in agricultural research leads to the development of agronomic methods that protect the soil, water, ecosystems and underlies America's $94 billion value added food system. In times of budget austerity, it's clear that research programs must be scrutinized, and we believe more emphasis should be paid to scientific merit, pertinence to agricultural needs and goals, and potential redundancy.

The Institute of Food Technology urges that improvements in the overall agricultural research enterprise be sought to refine some of the long term goals in agriculture research, to set priorities for research that heed the needs of producers, processors and consumers, to foster imaginative solutions to problems through USDA, land grant, and private sector team building partnerships, collaborations.

And we expect that the USDA will foster closer ties with land grant universities. We also would like to see agricultural research transcend short term political goals and pay more attention to long term strategic accomplishments.

As a scientist, it is widely acknowledged within the scientific community that competitive merit review by external peer reviewers produces the highest quality science, and we believe the highest quality research. In agriculture, however, the National Research Initiatives, Competitive Grants Program, the NRI, represents only a very small part, about .06 percent of the USDA total research funds.

As you have just heard, there's some controversy surrounding whether competitive grants or other programs are more important. We believe that the competitive programs such as the NRI are vital to the development of fundamental knowledge in the food sciences and the fiber sciences. The Institute of Food Technology supports strongly the administration's budget proposal for the USDA, which includes a $33 million dollar increase in the National Research Initiative Program.

IFT also supports, of course, the Fund for Rural America, which has within it a minimum of $33 million for competitive research. We trust that the appropriation for the Fund for Rural America will reflect the Congressional wisdom and not reduce appropriations for other competitive research within the USDA.

IFT believes that the agricultural sciences will be strengthened and well served by expanding the system of competitive grants based on scientific merit and peer review. I am somewhat concerned by the administrative terminology that was used here this morning by the USDA talking about merit review.

Merit review in my mind means administrative and political review in many cases rather than scientific review. I think it's very important that there be scientific members on committees reviewing all aspects of research that are funded by the USDA.

The Institute of Food Technologists acknowledges the substantial research that ARS laboratories are producing in spite of declining funding that becomes apparent when costs are compared with funding increases. In times of funding constraints and aging facilities, however, it is our belief that efforts to consolidate ARS facilities should be reinvigorated, and that ties with land grant universities such as the Centers for Excellence that were mentioned earlier should be strengthened.

Coordination of research priorities and initiatives within the USDA must ensure that research funds are directed to priority needs and are responsive to emerging scientific and public policy needs. Current funding mechanisms may not result in the best science being directed at the most urgent research needs.

We believe that carefully targeting research investments will increase the probability of finding solutions to the complex long term challenges confronting America's food and fiber system.

Thank you very much.

Mr. ALLARD. Dr. Nelson?

STATEMENT OF JERRY NELSON, REPRESENTING THE AMERICAN SOCIETY OF AGRONOMY, CROP SCIENCE SOCIETY OF AMERICA, AND THE SOIL SCIENCE OF AMERICA

Mr. NELSON. Good morning. I appreciate the opportunity to testify before you today on the critical importance of agricultural research funding. The complete statement was previously submitted to the subcommittee. My name is Jerry Nelson, and I'm a professor of Agronomy at the University of Missouri.

And I'm also currently president for the American Society of Agronomy. I testify today on behalf of the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America, which are non-profit scientific and educational organizations often referred to as the TriSocieties.

The TriSocieties have over 12,000 active members and serve over 10,000 certified professionals. A major goal of the TriSocieties is to promote effective agricultural research. Therefore, it is an honor to provide the subcommittee with testimony concerning research funding.

We support the efforts of this Congress to balance the Federal budget. We know this is a difficult task and requires many challenging decisions. It is precisely at these times, however, when Government spending is being reduced that an increased commitment to federally funded research and development is most critical.

The Federal Government must foster and support and strong and viable agricultural sector that is able to meet the food and fiber needs of the American people. Accomplishments of U.S. agriculture research are deservedly well heralded.

And the main beneficiary of this enhanced efficiency based on the research is the American consumer who has a consistent, abundant, safe and affordable food supply. But the expectations for agriculture research are changing. Expanded research and development are needed to enhance international trade and global competitiveness of U.S. agriculture enterprises.

Over the past 25 years, agricultural exports have helped decrease the U.S. trade deficit by generating more than $100 billion dollars annually in U.S. business activity. Reduced restrictions for international trade and the growth and size and affluence of developing countries have resulted in even higher agriculture export levels.

However, despite the overall increase in agriculture exports, U.S. share of the world market is declining. We need to increase our export of processed food products with high valued added research activities directed at the production differentiation, enhancement of quality, managerial expertise, industrial innovations, and many other considerations are essential to the manufacture of consumer ready products to help the United States remain competitive in the global market.

Recent achievements in plant and animal genetics have given us a better understanding of growth and disease processes. Advances in molecular genetic techniques or biotechnology provide unlimited opportunities for improving test resistance, quality, nutrition and value added potential.

As already stated, the TriSocieties strongly support agricultural research but would not favor any reductions of its funding. However, we would like to offer some ideas which might improve the efficiency and effectiveness of agricultural research. Priority setting for agriculture research should involve a bottom up approach.

Agriculture research that is supported by USDA and the land grant university serves a number of clients and customers including farmers, processors, commodity groups, farm groups, agribusiness, environmentalists, and public interest groups. A bottom up approach requires input from all of these sectors to identify the needs or issues to be addressed, synthesize a consensus, and to develop a context of a national priority system.

We acknowledge the creation of the national agricultural research, education and economics advisory board. Such groups can be effective in planning and prioritizing issues because they are better able to address specific problems.

Further, the national board can best work at identifying common denominators across the system. Although we strongly support stakeholder input for identifying problems and establishing priorities, we encourage maintaining an effective scientific peer review system for individual programs and projects.

We caution against developing a review process however that will overly encumber the research system. The Federal Government has a vital role in supporting the continuum through applied research. Federal research should focus on areas of national importance to agriculture. For example, plant and animal germ plasm acquisition, enhancement, preservation and on animal and plant genome mapping.

We support the ARS mandate to identify and to conduct research with broad national and regional benefits as compared to the more local returns expected from state research institutions. ARS also provides the opportunity for long term and high risk research that applies to national and regional problems.

State experiment stations also contributed to basic research and have responsibilities for graduate education and post doctoral training, both major benefactors from research funding. The effectiveness of the research can be enhanced by keeping the area focused on real problems and by conducting the applied research in regions of adaptation and utility.

Fundamental research can be conducted in many places. A research and applying and integrating the technology needs to be in areas where the need is really there. These needs and the applicably of the research for that problem can be best determined locally.

Industrial research and development is inherently linked to the profit potential of a particular product or technology. And as such, is normally short term in nature. Partnering and cost showing should be encouraged among the private and public sectors by initially including private interest in areas of public funded research, which seems promising for industrial applications.

There are new models for cooperation involving practitioners and interdisciplinary teams including basic researchers that will help focus the effort and shorten the time for technology adoption. Focusing on solving problems increases the efficiency but requires problem definition.

This can best be done with inputs at the regional or State levels by persons who are familiar with the strategic issues. The grant proposal process does need stream lining.

Mr. **ALLARD**. Excuse me, Dr. Nelson. Are you close to wrapping it up?

Mr. **NELSON**. Yes.

Mr. **ALLARD**. Okay.

Mr. **NELSON**. And there are some thoughts that we could give you along those lines. I can pick that up a bit later. Accountability is also something that is a real asset for research. Focusing the research on recognized priorities is a big step. Ensuring the new technology is rapidly moved towards use is another. And the two are not always mutually exclusive.

Extension and industry have the greatest roles to apply in the applied area. The Federal Government has a large role to play in integrating basic and applied research in areas for private industry will eventually take over and when public well being requires their funding.

Again, on behalf of the societies, we appreciate the opportunity to contribute at this testimony.

Mr. **ALLARD**. Thank you, Dr. Nelson. I'm sorry I had to interrupt you. We try to stay on a time line. And I was looking for an in conclusion comment and didn't get one. Dr. Rissler?

STATEMENT OF JANE RISSLER, REPRESENTING THE UNION OF CONCERNED SCIENTISTS

Ms. **RISSLER**. Good morning. My name is Jane Rissler. Thank you for the opportunity to appear this morning. I am presenting testimony on behalf of my colleague, Margaret Mellon, who regrets that she can't be here today to discuss the important issues associated with agricultural research.

I represent the Union of Concerned Scientists, a public interest organization which advocates responsible policies at the interface of technology and society. UCS is interested in practical technologies that meet human needs without bankrupting the environmental endowment on which future prosperity depends.

In a word, technologies that are sustainable. In agriculture, UCS advocates the transition to practices that combine high productivity and environmental protection. UCS sees the challenge to agricultural research in the 21st century as follows:

Farmers need new tools, information and practices that will preserve the productivity gains of the last century while at the same time providing strong protection for the environment and a basis for vigorous world economies. We believe that the most potent and flexible approach to agriculture grows out of understanding farms as systems whose elements can be manipulated to meet various objectives.

To get the greatest advantage from these approaches, farmers need to break out of the confines of mono-culture and industrial livestock production and embrace a new agriculture based on sophisticated systems management. This entails a transformation of a magnitude that cannot occur without a redirected and innovative research base.

If we take the charge of multiple goals seriously and believe that the systems approach is the best to equip our farmers to meet them, we need new modes of research to make systems approaches practical for farmers. We see opportunities on two fronts. First, increased agricultural diversity. And second, increased skills to manage farms as systems.

By agricultural diversity, we mean using more breeds and varieties of livestock and crops on farms, new plants used as foods, new non-food uses for crops. Among other advantages, increased agricultural diversity will help farmers spread and manage the risks of the inevitable roller coaster of prices on the global commodity markets.

The U.S. inventory of economically attractive crops and livestock is limiting as a result of our enthusiasm for mono-culture and the structure of our research and commodity programs which has tended to focus on a very few crops.

Now that we are moving away from support programs, we need to identify and develop an expanded set of crops and livestock. Diverse farming operations also demand different management skills than ones based on mono-culture. Our research system is weak in the area supporting the development of such skills.

In many areas, agricultural research has tended to focus narrowly on issues like yield and inputs, often favoring approaches that overwhelm natural systems rather than working with them. In terms of basic research, we need to pay more attention to traditionally under funded areas like agroecology, population genetics, and soil ecology and quality.

These areas of basic research are fundamental for a systems based agriculture and sorely needed to complement the molecular level of genetic research so in vogue today. The USDA supports a number of in house and extra mural programs whose mix of research topics could be adjusted to amplify the basic research effort in areas that support systems.approaches.

In addition to a more balanced basic research agenda, we need more applied research on systems based approaches. We are fortunate to have in place a program that is at the cutting edge of applied research, the Sustainable Agriculture Research and Education Program, or SARE.

SARE is an innovative and effective program that deserves a higher level of support than it currently receives. Programs like SARE will be increasingly important as more and more farmers enter a more competitive marketplace.

UCS has long been concerned by our excessive dependence on fossil fuels for energy. One way to reduce pollution problems associated with fossil fuels is to substitute biomass in the form of fast growing trees and crops. We recommend increasing research efforts for identifying and developing diverse crops for use as power crops.

In summary, UCS wholeheartedly supports the need for continued generous support of agricultural research as essential to the advance of U.S. agriculture. We commend to this committee a new vision of agriculture based on diversity in crops and livestock and a new sophisticated approach to systems management.

We recommend that the USDA research agenda reflect a solid commitment to basic and applied research that would support systems management, whole farm planning, and the development of new crops and livestock breeding.

We recommend SARE as a model program for applied agriculture research in the next century. Finally, among the many possible new uses of crops, we especially favor the sustainable development of grasses and trees as a renewable source of energy.

Mr. ALLARD. Thank you very much, Dr. Rissler. Dr. Thompson?

STATEMENT OF WILLIAM THOMPSON, REPRESENTING AMERICAN SOCIETY OF PLANT PHYSIOLOGISTS

Mr. THOMPSON. Thank you, Mr. Chairman. I appreciate the opportunity to appear before the committee today on behalf of the American Society of Plant Physiologists. ASPP is an organization that represents over 5,000 plant scientists in academia, government and industry.

As for myself, I'm faculty member at North Carolina State University where I hold the title of University Research Professor of Botany, Genetics and Crop Science. I'm speaking today on the issue of peer review and the importance of peer review in science. And I've had quite a bit of experience with peer review myself having served on several grant review panels both at NIH and at USDA.

And I've served one term as panel manager for a panel at USDA. I believe the peer review process is much more than just a means of selecting the best proposals. It also functions to upgrade the quality of the science being carried out around the country.

I know my own science has been much improved by having been subject to peer review over the years. I've learned a tremendous amount. I've had a tremendous amount of feedback, both from proposals that were successful and from those that weren't.

With the possible exception of facing the voters at election time, I think there's really no more effective form of feedback than peer review. There are a number of other important advantages to the peer review process though, and I'd like to mention just two of them right now.

The first is that peer reviewed competitive programs attract participation from a broad range of scientists around the country, from private, state, and Federal agencies. They're all competing together. The competition and the bringing people in from different places creates a leavening effect facilitating rapid dispersal of new insights and perspectives. You tend not to get this effect in more structured systems.

Second, peer reviewed science is responsive and flexible, putting a premium always on new initiatives and ideas. Applicants for these grants must design experiments that are at the cutting edge of their discipline or they won't be funded. And the system as a whole can respond quite quickly to new ideas and discoveries because new proposals are being considered all the time from all sources and because the same programs don't have to be continued indefinitely.

The investment is short term. The flexibility keeps our investments targeted to the most productive areas of science. It's also important to note that a good peer review system is anything but an old boy network, as some people have claimed. From my experience as manager of an NRI review panel, I can make three main points here.

First, both the panel members and the panel managers are selected for their expertise and as representatives of the scientific community. And they're rotated frequently to assure widespread participation. Panel members serve up to 3-year terms typically. And panel managers serve only 1 year at a time.

Second, extensive precautions are taken to avoid conflicts of interest, both financial and intellectual. If you'd like to know more about that, I can respond to questions.

Third, proposals are evaluated by a process of open panel discussion involving typically 10 to 20 experts in relevant sub-disciplines. Each proposal receives multiple independent evaluations from panel members and also from outside reviewers. The priority ranking relative to other proposals is by group consensus, and it can't be altered either by the panel manager or the USDA staff once it's established by the panel.

So all in all, I think the system is very effective at selecting proposals on the basis of scientific merit. The difficulties come from the fact that there are many more productive researchers than there's money to fund them. But that's hardly a problem unique to peer review.

I'd like to finish with a few words on limitations and opportunities. We're in the midst of a biological revolution that may well surpass the revolution of electronics in its impact on the human condition. You read about new advances almost every day, usually in connection with human health, not with agriculture.

The biological revolution has been slow to produce practical applications in agriculture. In my opinion, this is largely because of a lack of basic knowledge about agricultural species, especially plants. Practical applications are coming, however. Some of my industrial colleagues are estimating that up to 6 million acres of transgenic crops may be planted this year, and that plant biotechnology sales could reach $2 billion by 2001 or $6 or $7 billion by 2005.

In an increasingly competitive global market, I believe it will be increasingly important to invest in nationally competitive peer reviewed research to provide the intellectual capital required for continuing innovation in the private sector.

I thank you very much for your attention.

Mr. ALLARD. Thank you, Dr. Thompson. Dr. Barry?

STATEMENT OF PETER BARRY, CONSORTIUM OF SOCIAL SCIENCE ASSOCIATION

Mr. BARRY. Thank you, Mr. Chairman. My name is Peter Barry. I'm a professor and researcher in agriculture economics at the University of Illinois and a past president of the American Agricultural Economics Association. I'm testifying on behalf of the consortium of social science associations representing nearly 100 professional societies concerned with Federal support for the social sciences.

I'll address several issues involving the agricultural research system and social scientists working in agricultural economics, rural sociology, family and consumer sciences, communications and agricultural education. First, when the NRI was established several years ago, the primary social science component was the Markets Trade and Policy program later named Markets Trade and Rural Development.

The title was to include all social science issues in the agricultural research system, but it has largely focused on markets and trade along with rural development. These are important issues, but they exclude numerous others including the industrialization of agriculture, risk management in agriculture, electronic information systems, and the economic security of rural families and communities.

We respectfully request changing the name of this NRI program area from Markets Trade and Rural Development to Economic and Social Systems. This will broaden the focus and be consistent with other NRI programs focusing on animal systems, plant systems, and agricultural systems.

Our second issue is interdisciplinary research. Many of the research programs of the NRI were organized along disciplinary lines. While many of the important problems of the day involve multiple disciplines. Interdisciplinary research is on the increase and numerous success stories can be cited, but much more needs to be done. So we urge a continuing focus on interdisciplinary work in the NRI and other agriculture research programs.

Third, we support the authorization in the farm bill for policy, research and education centers at land grant universities to have quick turn around policy focused analysis of pressing issues. Policy research centers can mobilize university resources, perhaps involving multi-university and government partnerships. Quality of leadership in the centers will be the key. The policy center idea is a good one.

Fourth, funding mechanisms. From our vantage points, a balance of formula funds, in house funds, special grants, and competitive grants is effective. Federal data indicate that social scientists receive about 4 percent of competitive grant funds in the NRI, 8 percent of formal and in-house funds, and 12 percent of special research grants earmarked by Congress. The higher percentage from special grants reflects the growing priority of social and economic issues.

Targeting support through special grants has been a quicker way to meet new research goals and priorities than trying to reallocate NRI and formula funds. Special grants also offset the concentration of competitive grants in a few states. A recent ERS report indicates that a larger share of special grants have gone to states receiving a smaller share of competitive grants.

The new research support under the fund for rural America and the farm bill is most welcome. But how it relates to the NRI and how it is synthesized in the overall research portfolio need careful attention.

Our final point. Social scientists are especially able to answer the "so what" of science. How much does research cost, what are the benefits, when do they occur, who is affected, what are the economic, social and environmental trade offs? All these fall under the social science umbrella. The Government Performance and Results Act calls for a structured process of planning, prioritization and evaluation.

A process is only a necessary but not a sufficient condition for effective action. Sound implementation and solid performance measurements are needed as well. As addressed by USDA, we urge that social science expertise including that of agricultural economists be utilized throughout the process.

Thank you very much, Mr. Chairman.

Mr. ALLARD. Thank you all for being on the panel. I'm just going to have one general question for you. There are arguments both ways on how you set your priorities in research. Do you start from the grass roots up? Frequently you're talking from applied use of research, and people usually think of those priorities in terms of what they already know.

And sometimes you need to go and solicit input from individuals who have new ideas, and they need to interject that into the system. And because of these new ideas, if you strictly go from the background up, they never get brought in. You need to have something there at the top or new ideas are coming in, and then once these new ideas get suggested to the people at the bottom, they get applied.

And how do we reach that balance, and are you comfortable with the advisory committee that we're setting up? Do you think we'll reach that balance through that advisory committee and the way the process is going? So, I thought you might comment on that a little bit for the record if anybody cares to.

Mr. SWANSON. Just a very quick comment. I think the advisory committee obviously includes everyone except someone from Colorado, or Texas as well. Anyway, it does include a number of people from associations. And I think in many cases, we probably are not taking advantage of the many associations—the professional associations that are available across the country.

The Institute of Food Technologists, as I mentioned, and who I represent, includes a large number of people from industry, consumers, nutritionists, and food scientists, all of which have an input into what's going on in the societies and helping establish priorities within those societies. When they can bring this to an advisory board or bring it to the USDA, it surely is beneficial.

Mr. ALLARD. Thank you. Any other comments? Yes, Dr. Thompson?

Mr. THOMPSON. I might agree with those comments and just add the thought that, I wouldn't want to distinguish between top down and bottom up quite so cleanly as that. I would want to say that there needs to be an interaction. Certainly we need the advisory committee that you're talking about to identify problems and to kind of serve as a liaison with the stakeholders.

I think it's equally important, though, that we have unfettered scientific inquiry into the operations of organisms and basic processes, and that those investigations not get confused with investigations that are aimed at specific application problems.

And I also would like to say that I don't think the advisory committee, useful as it is in setting overall priorities, can substitute for a peer-based competitive review process of individual scientific proposals—there always needs to be a peer review process where experts in the field are assessing scientific quality.

Mr. ALLARD. Dr. Barry?

Mr. BARRY. At the University of Illinois, our College of Agriculture has an external advisory committee required by university statute. Each department in the college has an external advisory committee also required by statute.

And my own research program has a steering committee comprised of stakeholder groups. It's essential for getting interaction on what we do and what we found in our work.

Mr. ALLARD. Thank you. Yes, Dr. Nelson?

Mr. NELSON. I would look at it as a continuum. I certainly agree with what the others have said, that as we go to basic research and very basic research, it would be very difficult to use an advisory committee other than to just point out some of the high priority areas that we need assistance.

But as we move to more and more applied research, and particularly as we get to site specific and regional research, then the priorities can be helped out a lot by having some input from a broad range of people.

Mr. ALLARD. Thank you. Okay, that's all I have. The gentlewoman from Idaho maybe has a question or two?

Mrs. CHENOWETH. Thank you, Mr. Chairman. Dr. Rissler, can you tell me a little bit about the Union of Concerned Scientists. Who funds them and who belongs to the organization?

Ms. RISSLER. We have a membership base of both scientists and non-scientists. We get a significant amount of our support from what we call our sponsors, these members. I can't remember the exact number. I'm thinking 80,000. I could give you a more definite number.

We get funding from foundations and from private donors.

Mrs. CHENOWETH. I see. You mentioned a couple of things in your testimony that I wanted to give you a chance to expand on for the record. I'm not sure that you testified to this. This may be a little bit unfair since it wasn't your testimony in the first place.

But if you can help me out, that would be good. If not, we can write to Dr. Mellon. But in her testimony, she testifies to the fact that diverse farming operations demand different management skills than ones based on a monoculture.

What does she mean by a monoculture?

Ms. RISSLER. Essentially planting all corn year after year or perhaps in rotation with soybeans 1 year. A diverse farming system, a farmer might be growing six or seven crops simultaneously and might have fields going through 3 or 4 or 5, 6-year rotations with different crops.

So a farmer might be growing alfalfa, corn, amaranth, soybean, clover, a wide array of crops, rather than focusing on just corn or just soy bean. Now these diverse crops are extremely important in preserving soil fertility, in reducing pest problems, in providing different products for different markets.

Mrs. CHENOWETH. I find that very interesting because as we look back even thousand of years ago, we realize that in Israel they were commanded to rotate their crops in order to diminish——

Ms. RISSLER. Oh, yes, indeed you are right. Rotating crops is a very old practice and a very wise practice. But it is one that many farmers, I fear, have abandoned in the last 50 years as they have come to rely on external inputs like fertilizers and pesticides to substitute for the crop rotations.

Mrs. CHENOWETH. Some of our problems in the Congress today is keeping up on the moving definitions of new words. One thing that is interesting to me—you mentioned in your testimony about soil ecology and crop ecology. Now, I asked the same questions of the Speaker of the House, what do you mean by biodiversity and the ecology, because it appears to be so large that it's not definable.

What did you mean, though, for the record, by soil ecology and crop ecology?

Ms. RISSLER. Soil ecology has to do with pretty much that community, that ecosystem within the soil. The microbes that are interacting, the nutrients that are interacting within the soil itself. Now, of course, the soil is affected by products from above the soil through crop debris, water, nutrients.

But primarily it has to do with that vigorous community that should be existing within the soil. Now, crop ecology is a broader term because we're talking about both the above ground and below ground growing parts of a crop, and we're talking about the larger community associated with the crop in crop margins in wildlife, habitats near the crop.

So it is a broader term.

Mrs. CHENOWETH. Thank you, Dr. Rissler. Dr. Swanson, welcome. Very pleased to have you before the committee. Are we getting a handle on TCK-smut out there in the northwest in our soft white wheat?

Mr. SWANSON. I spoke with a couple of representatives from our plant pathology department last week, and they indicated that we were. But of course, because of our cold weather, it's not as much of a problem as it is down south. So they appear to have everything under control.

At least that's what I was told.

Mrs. CHENOWETH. That's great. That's something that I'm very, very interested in as well as the problem with leafy spurge, a noxious weed that I hope that by genetic development of insects, that hopefully we can get a handle on.

We're having a huge problem in Idaho with leafy spurge.

Mr. **Swanson**. It's quite a problem. And to my knowledge, there's not much progress been made with leafy spurge as has with the smut.

Mrs. **Chenoweth**. Would you personally stay in touch with me as we see any new developments on that? And you know, something this committee loves to hear are the accomplishments of what the panel can bring to us. So, another thing that you testified to is—that's a very serious concern to this committee is that we make sure that we transcend short term political goals from long term strategic accomplishments.

I'm very concerned about this, so is the entire committee. And I think you for dealing with that. What guidance for the record can you offer to help ensure that research is based on scientific merit, economic merit, and long range priorities and how can long term goals within this area be best established, Dr. Swanson?

Mr. **Swanson**. That sounds like a loaded question to me, but——

Mrs. **Chenoweth**. It is, for the record.

Mr. **Swanson**. I think again there are a number of things that can be done, of course, and they all are very general. But if I was to list some, I would of course say improve coordination and communication among the USDA and other agencies in Washington.

Prioritization is not limited, of course, to the USDA or to CSREES or to ARS. And in fact, should include the inspection agencies which were discussed before, FSIS, FDA. It would be nice if perhaps some interagency communication was there between NSF and NIH and the other agencies that also look at food and safety programs.

It would be very nice if we talked a lot about peer review and scientific merit. I think this affects the funding of productive research. And I think it's important that research be evaluated and that non-productive research be eliminated from any research programs in that way releasing money for more productive and progressive research.

I think it's important that we have cooperative efforts, interdisciplinary and non-interdisciplinary between the USDA, other Government agencies and the university system, which employ many, many research scientists across the country.

In doing all of those things, I think we—with establishing priorities, would enhance the potential for doing more productive long term, fundamental and applied research.

Mrs. **Chenoweth**. Thank you, Dr. Swanson. Thank you, Mr. Chairman, for holding this hearing. And I just want to say that next year when we hold this same hearing, I really do want to urge the members who testify in front of the committee to share with us the accomplishments too. More specifically, the accomplishments rather than the process.

Thank you, Mr. Chairman.

Mr. **Allard**. Thank you. The Chair would ask unanimous consent that the record of today's hearing to remain open for 10 days to receive additional material and supplementary responses from witnesses to any questions posed by a member of this subcommittee. Without objection, it is so ordered.

I want to thank the panel. The Subcommittee on Resource Conservation, Research and Forestry stands adjourned.

[Whereupon, at 12:11 p.m., the subcommittee was adjourned.]
[Material submitted for inclusion in the record follows:]

STATEMENT OF CATHERINE E. WOTEKI, PH.D., R.D.

DEPUTY UNDER SECRETARY

RESEARCH, EDUCATION, AND ECONOMICS

Mr. Chairman and members of the Subcommittee. Thank you for the opportunity to discuss with you the importance of agricultural research. Accompanying me are Dr. Floyd Horn, Administrator of the Agricultural Research Service (ARS) and Dr. Bob Robinson, Administrator of the Cooperative State Research, Education, and Extension Service (CSREES).

With the passage of the Federal Agricultural Improvement and Reform (FAIR) Act of 1996 and its increased reliance on markets, research to support the American food and agricultural system is more important than ever. FAIR changes the nature of government support for the farm-income safety net provided by commodity-programs and steers American farmers towards reliance on the market place. Our investments in research, extension, and education are central to enabling farmers to compete in domestic and international markets. While the challenges are great, so are the opportunities. The establishment of international trading rules for agriculture through GATT and NAFTA increases our access to new emerging markets. Global growth in demand for food products is likely to be significant for several years to come, particularly in Asia, where many people are realizing increased incomes and improved diets. American producers will need access to new technology as well as timely information to compete in these global markets. They will also need better risk management tools to help them withstand price swings. The research, statistical collection activities, and education and extension programs of the USDA can make major contributions to securing the future of American farms by providing the scientific basis for new technology and access to information and risk management tools needed in this new environment.

The FAIR Act also renews the Administration's commitment to natural resource conservation, and USDA's research and education programs must keep pace with this commitment. FAIR continues the Conservation Reserve Program, maintains conservation compliance provisions and the wetlands program, and contains new incentive programs to promote soil and water conservation. Implementation of these programs in a cost-effective manner requires improved understanding of relationships between farming practices and resource quality. We will need to continue to develop and promote farming practices that mitigate potential harm to the environment.

With regard to rural development, we need to better understand what FAIR implies for the structure of agriculture and rural economies. We need to know whether changing the support for commodity programs will accelerate the move toward fewer and larger farms. Research on these issues is needed so that appropriate policies can be designed to enhance the economic health of our rural communities.

By strengthening our commitment to agricultural research, extension, and education, we can ensure that we will continue to enjoy a competitive farm sector, a strong rural economy, abundant natural resources, and a healthy, well-nourished population.

Toward these ends, agricultural research and education continue to demand active participation of the Federal Government. Because the benefits from agricultural research are diffused broadly, the private sector lacks the incentive to adequately invest in it. For example, USDA economists estimate that private seed companies only capture about 10 percent of the economic benefits from improved soybean, cotton, and wheat varieties through higher seed prices. The remaining benefits are passed on to farmers as higher net production and, eventually, to consumers as lower-priced food. As a consequence, the private sector generally underinvests in research. State governments also lack the incentive to fund many types of research because benefits frequently accrue to farmers and consumers outside the State that paid for the research.

For more than a century, the Federal Government has played a major role in supporting agricultural research, helping to transform U.S. agriculture from a resource-based industry to a science-based industry. Since World War II, agricultural production in the United States has more than doubled, even though total resources used in production have actually declined. In other words, virtually all growth in agricultural production has come from applying new technology with greater efficiency, rather than from expanding the resource base. This has been in a large part a result of our investment in agricultural research, extension, and education. This investment has enabled a steady flow of improved technology to become available and quickly diffused to American farmers. This has served to keep food prices low to consumers and release resources from agriculture for other uses.

Moreover, agricultural research continues to be a solid public investment. USDA economists have found that publicly funded agricultural research has earned an annual rate of return of at least 35 percent. Moreover, these benefits are broadly shared by farmers, consumers, and agribusinesses. This high rate of return suggests that a further allocation of funds to agricultural research would be generally beneficial to the U.S. economy.

At the same time, demands placed on the U.S. agricultural research system are growing. Consumers, producers, and taxpayers expect a wider set of issues to be addressed, including consumer health and food safety, environmental protection, and rural economic opportunities. Federal expenditures for agricultural research account for about 60 percent of the total financial support for public agricultural research in the United States. However, Federal expenditures have not grown in real (inflation- adjusted) terms since the mid-1970's. Our ability to reallocate existing resources to new emerging issues is constrained by existing needs. For example, as much as 30 percent of current public sector agricultural research goes simply to maintaining current productivity levels, due to different plant and animal diseases. Increasingly scarce resources for public agricultural research place a greater burden on research administrators to allocate resources to high-priority areas.

Given these factors, it is appropriate and timely that Congress assess public versus private, and Federal versus State, responsibilities in science and technology development. The most compelling case for Federal funding is for more basic agricultural research, for developing technologies where private incentives are weak, and for research that improves public and private decision-making. Basic agricultural sciences include such fields as plant and animal genetics, pathology, and physiology; the conservation and development of unimproved plant and animal germplasm; human nutrition; food safety; soil physics and soil chemistry. Knowledge developed through this research can then be passed on to our partners in the private sector for development of new commercial products and technologies. The public sector may also need to assist in development of specific technologies in cases where private sector incentives are weak but where the potential benefits to society are large. These include development of technologies that enhance or protect the environment; breeding of certain nonhybrid and minor crops; and public policy studies. Federal support for research that improves public and consumer decision-making includes areas such as basic and applied research on agriculture's relationship to water quality; global climate change; soil quality and land degradation; ecosystem loss; human nutrition and diet; and food safety and quality. These are all areas where there is a clear "public good" to be achieved.

In designing Federal policy toward agricultural research, we should consider a variety of approaches to support and encourage agricultural research in the United States. We need to consider how to strengthen the Federal-State partnership in agricultural research. We also need to encourage more public-private collaboration in agricultural research so that advances in agricultural science and technology are quickly brought into widespread commercial use.

To address how Federal policies are affecting the agricultural research system in the United States let me first discuss the historical Federal-State partnership in agricultural research between the USDA and the land-grant universities. I will then turn to how we are enlisting the help of the private sector in investing in agricultural research.

Institutional changes in the Federal-State partnership in agricultural research are affecting how research priorities are determined, the mission of the land-grant universities, and the distribution of Federal funds among States. Federal support for agricultural research at land-grant universities and State agricultural experiment stations increasingly comes as project funding instead of the traditional block grant, or formula-funding, system. Historically, formula funding was the core of the Federal commitment to agricultural research at the land-grant universities. Formula funds encourage State governments to invest in agricultural research because they are required to match Federal formula funds if they wish to receive them. In 1970, formula funds accounted for 61 percent of all Federal support (USDA and other agencies combined) for agricultural research at the land-grant universities. By 1994, Federal support of state institutions fell to an average of 30 percent, demonstrating that the matching-fund provision has been quite successful in mobilizing State governments to support research. Today, in fact, most States meet or exceed the matching-fund requirement in their support of agricultural research.

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In recent years the Federal government has turned increasingly toward project-based funding instead of formula funding to support agricultural research at State institutions. By 1994, project funding accounted for 70 percent of Federal support of State agricultural experiment stations while the share in formula funds had fallen to 30 percent. Project funding comes in several forms, including competitive grants and special earmarked funds. The two approaches to funding research serve different purposes. The formula-funding system allows States to largely determine their own priorities. The use of competitive funding ensures that high quality research is done and allows the USDA to draw upon the expertise of scientists outside the land-grant university system. But it is also true that compared with formula funds, competitive research grants tend to be awarded disproportionately to a smaller number of large research institutions. The USDA has sought to maintain the level of formula funding while expanding funding for competitive research grants. We believe the optimal mix of Federal funding involves both formula funds to maintain stability in the State agricultural research system and competitively-awarded project funds to encourage the path-breaking research necessary to maintain the long-term viability of American agriculture.

Let me now turn to some issues concerning public-private cooperation in agricultural research. It is clear that agricultural research is now, more than ever, a shared responsibility of the public and private sectors. USDA economists estimated that private industry spent at least $3.4 billion for food and agricultural research in 1992, compared with $2.9 billion in the public sector. Judgments about how and where to spend public funds must consider the incentives for private agricultural research funding. For example, private research tends to be more commercially oriented than public research: more than 40 percent of private agricultural research is for product development, compared with less than 7 percent of public agricultural research. When it comes to investing in basic agricultural sciences, the public sector accounts for more than 75 percent of this research. Moreover, investment in public agricultural research may lead to more private research, because of market opportunities created by scientific and technological advances. There is little evidence that public agricultural research targeted to areas earlier defined to be "public goods" crowds out private research. In other words, a reduction in well-targeted public agricultural research is unlikely to be made up by the private sector--if anything, it may lead to a reduction in private investment in agricultural research since they are complementary.

Patent and regulatory policies affect incentives for private agricultural research. Private research has tended to concentrate in areas where there is effective patent protection for intellectual property. With patent protection, private firms feel more confident they will be able to earn returns on their research investments. Private research has tended to focus on improving farm machinery, agricultural chemicals, hybrid seeds, livestock vaccines, food processing, and food products. Where adequate incentives exist for applied private research, the public sector uses its resources to make fundamental advances in the underlying agricultural sciences. This focuses scarce public sector funds on research that is unlikely to be done by the private sector.

Recently, controversy has emerged over the patenting of new plant and animal varieties developed through biotechnology. Agricultural biotechnology represents an important new source of technology for American agriculture and the private sector has been particularly active in developing this potential. USDA economists estimate that, in 1992, private industry spent nearly $600 million on agricultural biotechnology research to take advantage of scientific advances made possible by publicly supported agricultural research. It is important that we provide the right set of incentives to further encourage this work. This includes a patent policy that will allow private companies to earn fair returns on their research investments. At the same time, we want to avoid situations in which patents may "lock up" key technologies with a few private companies. Establishing the right set of incentives for private research also involves regulatory policy. A credible, well-balanced regulatory system is essential for public acceptance of this new technology. We must ensure adequate environmental protection and food safety without unnecessarily delaying commercialization of promising new agricultural biotechnologies.

The private sector is also an important source of funds for research at our agricultural universities. Land-grant universities and State agricultural experiment stations rely on the private sector for an increasing share of agricultural research funds. The most rapidly growing source of funds for agricultural research at the land-grant universities is from non-government sources such as private industry, foundations, and product sales. Non-government sources accounted for nearly 20 percent of funds for agricultural research at State institutions in 1994, an increase from 14 percent in 1978. Increased private sector participation in funding research at public institutions can be helpful in forging public-private partnerships in agricultural science and technology. However, not all State institutions have fared well in attracting private funds. There are also concerns that too much reliance on private funding of public research could influence decisions about public research priorities. Maintaining the core commitment of the Federal government to the land-grant system and State experiment stations can assure the continued health of our State partners in agricultural research.

To further strengthen the public-private partnership in agricultural research, the USDA is developing new arrangements to increase collaboration and technology transfer between USDA intramural research and the private sector. Public-private collaboration is important to ensure that advances in basic agricultural sciences are rapidly commercialized into improved inputs for farmers and products for consumers. One way we are achieving this is through Cooperative Research and Development Agreements, or CRADA's. CRADA's are formal arrangements between Federal laboratories and private companies to jointly develop and commercialize new technologies. As of this year, USDA has entered into almost 600 CRADA's with the private sector and currently has over 200 active CRADA's with private companies. The USDA is also working to establish research consortia between public research institutions and private industry.

It is important to also recognize that in the effort to achieve a sustainable and productive agricultural economy, we are part of a larger international community. The advances in agricultural technology in the United States can serve to benefit the world not only by providing it with more abundant, low-cost food, but also by sharing our knowledge with other countries, particularly poor countries struggling to meet their basic needs. U.S. support of international agricultural research helps diffuse technology abroad and makes an important contribution to reducing world hunger and malnutrition and protecting the Earth's environment. The United States also benefits from the international exchange in agricultural science and technology. We depend on other countries for new sources of plant and animal germplasm for most of our agricultural commodities. We also learn from new ideas and knowledge developed elsewhere. It is important that we collaborate with public research institutions in other countries to continue to gain these benefits.

Thus while we believe that investing in research will help make the U.S. food and agricultural system more competitive in the global economy, we also recognize the importance of maintaining the "public good" nature of our investment in agricultural research. We can achieve competitiveness in global markets by collaborating with the private sector and by cooperating with public research institutions in order to enhance the truly "global good" that agricultural research can achieve.

INTRAMURAL SOCIAL SCIENCE RESEARCH

I would like to make some comments about another component of USDA's intramural research. It is the important work conducted by the Economic Research Service (ERS), our social science research partner in the Research, Education and Economics mission area. This partnership complements our strategic planning and our programs by providing the capability for a dollar and cents perspective on plans and initiatives. For instance, ERS is a full partner with other REE and USDA agencies in USDA's IPM Initiative. ERS research provides analyses that are helping us to understand the farm-level adoption of Integrated Pest Management systems and how in an application context, these systems affect farm costs, food safety, and water quality. ERS also has collaborated extensively with other REE agencies on the Department's water quality research, again assessing the cost and return impacts of USDA's multiple research, education, technical and financial assistance programs that are designed to protect the Nation's waters from agricultural chemicals and waste products. Another example is in precision farming, a new area of intramural research, where ERS is working with REE agencies to provide an evaluative analysis of decision making that controls the adoption of precision farming, and then considers how precision farming affects on-farm profitability, input use, and environmental quality.

ADMINISTRATION'S PROPOSALS

The Administration made a number of proposals to be included in the Research Title of FAIR 96. Some were included, such as an improved advisory committee structure and a task force to evaluate federally funded facilities. Congress also added a significant new authority in the Fund for Rural America, which will strengthen the Department's research and extension portfolio through grants competitively awarded to address specific problems. Other proposals have not yet been adopted and they remain important tools for strengthening our research capabilities and, ultimately, increasing farmer profitability, protecting the environment, and providing consumers with safe, high-quality food.

APPLIED RESEARCH GRANTS

In an era of constrained budgets, it is increasingly important to reexamine the Federal-State research and extension partnership to ensure that cooperative efforts are in the national interest leaving the states to support efforts that provide parochial benefits. An area needing better direction to reflect national research priorities is the Cooperative State Research Education and Extension Service (CSREES) Special Grants Program. About half the FY95 and FY96 appropriations for Special Grants were earmarked in the appropriations committees' reports. While earmarking Federal dollars may respond to a need to serve local priorities, a more coordinated approach would provide a coherent national strategy for focusing Federal investments. We propose strengthening the Federal-State partnership for research and extension programs by establishing a competitively awarded matching grant program for applied research. This competitive grant program would require matching funds from states and would replace the current earmarking process of CSREES Special Grants.

COMPETITIVE FACILITIES GRANTS

Like special grants, funding for construction of agricultural facilities on university campuses is earmarked in the appropriations committees' reports. In some cases, these facilities primarily serve crops of a local or regional interest and address problems with limited national significance. In some instances, Federal funds have been earmarked to fund facilities of little significance to agriculture.

Although the review process provided for in Section 884 of FAIR 1996 may lead to some improvements in this regard, the Clinton Administration proposes the authorization of a competitive grant program for university research facilities to replace the current earmark process and ensure greater equity and relevance of Federally-supported research facilities at the 1862 and 1890 Land Grant universities.

We propose that this new authority replace USDA's current facility construction grant authorities under the Research Facilities Act and the Competitive, Special, and Facilities Research Grant Act, P.L. 89-106. While the 1890 universities will be eligible for this new program, we also propose to continue the program of facility grants for 1890 universities under Sec. 1447 of the National Agriculture Research, Extension and Teaching Policy Act, of 1977, as amended. The program would allow the Secretary to require a matching grant from state institutions. Grants would be awarded to support the five outcomes identified in our strategic plan in accordance with the findings of the Strategic Planning Task Force on agricultural research facilities.

MAINTAINING GENETIC SECURITY

The long term viability of American agriculture is dependent on public investments designed to collect and protect germplasm. Without such collections and related research programs, the U.S. may not have the ability to respond to future pests, blights and diseases. Current collections are seriously under funded and are, in some cases, actually deteriorating.

In the 1990 Farm Bill, Congress asked ARS for analysis on the status and resource needs of the National Plant Germplasm System. Since then, requests for additional funding from ARS have largely gone unmet. The critical problem has to do with regeneration of seeds in storage.

Regeneration is a necessary means to preserving germplasm over time. Regeneration is conducted to replace low-quality samples with fresh seed. The shortage of funds have prevented the purchase of the necessary equipment and space for regeneration. Important data are not being fully captured from the regeneration sites due to a shortage of personnel. Quarantine research to speed introduction and to eliminate dangerous pathogens utilizing new technologies is also underfunded.

To maintain the genetic resources for our future food and fiber production system, USDA proposes authorization to create a new Fund for Genetic Security. The Secretary would be authorized to request $25 million annually over the next 7 years to support the collection, characterization, preservation and utilization of germplasm to benefit U.S. agriculture.

AQUACULTURE

Aquaculture is poised to become a major growth industry. Global demand for fish and seafood is projected to increase sharply over the next several decades, while harvests from wild-catch ocean fisheries are stable or declining. A dramatic increase in aquaculture production is needed to meet future fish and seafood demand and to offer domestic and international consumers abundant supplies of high-quality, safe, wholesome, and affordable fish and seafood. Aquaculture development also holds particular promise for rural communities. New aquaculture technologies can create new jobs and foster economic development in rural communities.

The Administration supports reauthorization of the Regional Aquaculture Centers and reauthorization of the National Aquaculture Act of 1980 with the following provisions: establishing private aquaculture as a form of agriculture for USDA programs; retaining the Joint Subcommittee on Aquaculture (JSA) and maintaining USDA's designation as the lead agency for coordinating policy and programs for private aquaculture through the JSA; including aquaculture in all authorities for USDA research, education, and extension activities; and establishing a program to accelerate the transfer of promising research and technical advances, including environmental technologies, to commercial aquaculture applications.

Thank you for the opportunity to discuss the importance of agricultural research. My colleagues and I are happy to answer any questions you may have.

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Testimony for the House Subcommittee on Resource Conservation, Research and Forestry relative to a review of federally funded programs in agricultural research, education, and extension

May 14, 1996.

I am Dr. Robert G. Zimbelman of the American Society of Animal Science and am here today to testify on behalf of CoFARM a coalition of professional organizations whose members are engaged in research, education and extension. In addition to traditional plant and animal agriculture societies, we have members from groups involved in the food processing, agricultural engineering, and social science areas. Many members of our organizations are also involved in industry as employees or consultants in a variety of technical areas.

What science is necessary to defend our country but is not in the Defense R&D budget? What science is vital to prevention of human diseases, but not covered by the NIH budget? What science is primary in optimal use of natural resources and preserving the environment, but not in the budget of EPA? The science behind Agricultural research is the answer. The members of this committee undoubtedly understand that, but we are not certain that your Congressional colleagues also have that understanding. Agricultural research is the underpinning needed for a well-fed military who can use high-tech weapons, it provides food from which to obtain proper nutrients to prevent diseases and maintain a healthy nation with long life-expectancy, and it has the greatest impact on our natural resource base of soil and water of any of our human activities.

Past agricultural research has been the investment that provided our current success. That science base has been responsible for the fact that less than 2% of our population can provide the base commodities to feed this country as well as for significant exports. The total impact involves greater than 16% of our population to provide the food and fiber that reaches our tables and homes. Those gains were made through a primary focus on production efficiency over many decades. Today, we need to broaden the agricultural agenda beyond production to other issues. This has to be done while maintaining production efficiency research to allow

Members
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• American Phytopathological Society • American Society for Horticultural Science • American Society for Microbiology
• American Society of Agricultural Engineers • American Society of Agronomy • American Society of Animal Science
• American Society of Plant Physiologists • Crop Science Society of America • Council on Food, Agricultural, and Resource Economics
• Federation of American Societies of Food Animal Sciences • Genetics Society of America • Institute of Food Technologists
• Poultry Science Association • Rural Sociological Society • Society of Nematologists • Soil Science Society of America
• Weed Science Society of America

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us to be competitive on an international basis. The agenda needs simultaneous focus on production and efficiency while adding consumer needs and societal issues relating to food quality, safety, convenience and cost. The public is also interested in how food is produced relative to an impact on the environment and the care of animals who produce those basic foodstuffs.

How was this past achieved? Through a mix of Federal in-house research, formula funds, competitive and special grants all with a focus on serving the public. The research agenda was a continuum of basic (understanding biology, physics, and chemistry) research and applying the results to agricultural problems and changes. This was then shared with the interested public through the Extension Service. This model has been the envy of the world, but today many people feel it needs to be reassessed.

Since we have been so successful, can we not just rest on our laurels and look elsewhere for awhile? Private industry has taken up some of the publicly supported basic research and used it to produce products for producers and consumers. Some of the initial research is high risk and requires a long-term investment. Other useful research may not lead to products. Research of this latter type must be developed and carried to the public with public funds. An example of this, is the current focus on looking at production systems on a comprehensive basis. The integration of knowledge to allow producers to remain competitive and adjust to changing consumer needs is the key. Private industry does not have the means nor the incentive to provide this kind of assistance. So we need multidisciplinary teams that work together to transfer this knowledge as never before in history. Such application will also help to identify the new components of basic and applied research to further refine and develop such systems.

The ARS provides in-house research and is committed to meeting the science needs for regulatory agencies of USDA such as FSIS, APHIS, etc. This is an important role and should continue. ARS probably could use a greater share of its funds for grants and contracts to assist with this role as it is not always possible to have adequate staff pertinent to emerging needs or crisis situations. Other in-house efforts which provide valuable services are ERS and NASS. Formula funds have been an important component in the success of the past and some level is critical to maintaining the infrastructure of the system. Competitive grants is the area which should become a greater part of the portfolio since they allow greatest flexibility and assure that programs measure up to some level of peer/merit review. The USDA competitive grants program is by far the smallest, in both dollars and percent of portfolio, of any Federal agency that supports research. Special grants will always be necessary to meet certain needs, such as minor crop or animal species, or minor uses, or emerging disease or pest problems. To the extent possible, these special grant funds should be awarded on a competitive basis which evaluates relevance to the problem first and then peer-judgement as to the potential to add information to understanding or solving the problem.

CoFARM Testimony
Page 3

Now that we have defended all of the current components of the program, does that mean everything should stay the same? Not necessarily. We would pose that the proper balance depends on what the goals are. We support the idea of a Stakeholders Advisory Board (SAB) that should be empowered to provide that answer. Past advisory boards have been special interest and each, predictably, supported its own special interest. We need to have a forum whereby competing interests can come together as never before to hear differing visions. With such a large constituency, a single board might have to be overwhelming in size. We propose a series of satellite groups which could help with this process. Satellite groups of 100 to 300 persons could meet on specific areas, such as: animal systems; plant and soil systems; processing ,quality and safety; societal and consumer concerns; or other similar focus areas. Even those would need to be multidisciplinary, for example animal systems would include agronomy and soil scientists and plant systems would have to include microbial and animal interactions on plant production, and economists in all focus areas, etc. Producers and consumers should be represented to present their needs and desires and scientists should be involved to explain how scientific goals and priorities could be formulated so as to contribute to the desired solutions. Persons from such satellite groups could reflect the conclusions of those meetings to the Stakeholders Advisory Board. Such a process would allow more stability of direction by expecting the Secretary of USDA to follow the advice of the SAB or justify deviations to Congress. Such a set of goals and priorities would then be much more useful in resolving issues of balance of funding mechanisms and roles of in-house and extramural programs. The Department could then work with its private and public partners to efficiently administer the programs judged to most closely meet the SAB goals and priorities.

In the interim, we suggest that the competitive grants program be enhanced while maintaining level funding of base programs. For intramural research, certain functions and flexibility may need to be strengthened while some small locations or programs without critical mass should be seriously reassessed relative to the goals and priorities of USDA/REE overall. The first stage question should be the fit of any program / location to the agreed-upon agenda. It is also important that the Undersecretary of USDA/REE ensure that Administrators of agencies work together well and be realistic about the capabilities of each to play the most complementary role possible in advancing the overall national agenda. In other words, change should be evolutionary, not revolutionary. Past success by itself does not justify future funding, but a successful system should not be jeopardized by changes that are not well founded because too much is at stake.

Thank you for this opportunity to provide input.

Victor L. Lechtenberg
Dean of Agriculture
Purdue University

Mr. Chairman and members of the Subcommittee, my name is Victor Lechtenberg. I am here today representing CAST (The Council for Agricultural Science and Technology). I currently serve as President of CAST. CAST is composed of 30 major food and agriculture societies. These are all professional and scientific societies whose individual members total more than 120,000. CAST's mission is to: a) identify food and fiber, environmental, and other agricultural issues, and b) to interpret relevant scientific research information for legislators, regulators, the media and others engaged in public policy decision making. Thus, CAST has a keen interest in the nation's agricultural research system.

My role in CAST is as a volunteer officer. I am also Dean of Agriculture at Purdue University where I have administrative responsibility for Indiana's land grant university programs in agricultural research, extension and education.

The nation's agricultural research, education, and technology system has been an important contributor to the exceptional productivity of today's U.S. food and agriculture system. Historically, research, extension and education activities were performed predominately by federal and state entities. During the last quarter century the private sector has also become a major performer.

In my opinion, there are two critical questions that must be addressed as we enter the next century. First, what is the proper quantity of agriculture and food system research, extension, and education needed to assure the competitive position of this important industry into the next century. Do we have too much today? Do we have too little? Second, who are the appropriate performers? What is the proper role and balance between federal, state, and private performers? Most importantly from the perspective of this Subcommittee, is there a critical Federal role and, if so, what is it and why is it critical?

Quantity of Research, Extension, and Education. Regarding the size of the nation's research, extension, and education portfolio, a case can be made for a larger collective investment. The economic contribution of the agricultural and food industry is commonly estimated at 15-18% of the nation's domestic economic output. Federal funding for the research and educational programs germane to the food and agriculture system is about 3% (about $2.1 billion) of total appropriations for all federal research and technology development. Total public and private sector investment in food and agricultural research is significantly higher, about $7.3 billion, but only 4% of the nation's total investment in research and development. By either assessment, investment in agricultural research and education is low relative to the economic value of the food and agriculture sector to the nation's economy.

Rates of return, calculated over the long term, suggest that the annual rate of return on research and education investments is high. Most studies show returns greater than 25% per year, suggesting that over the long term greater investments would pay good returns.

One might also consider the "quantity of research and education" question as a "breadth of expertise" question. This is an important consideration to CAST. As CAST prepares reports and papers, we draw on the scientific expertise of individual scientists from our member societies. Individual scientists might be employed by USDA, universities, or the private sector. If the aggregate size of the research system were reduced significantly, it is reasonable to assume that some key areas of expertise will be lost, or at least greatly reduced. This could diminish our national capacity to address future critical food and agriculture issues, especially if we needed to do so in a very short time frame such as could be the case with disease or pest epidemics in crops and livestock.

As the Subcommittee looks to the future, it is important to assess the size question in the context of changes that have already occurred in recent years. The size of the federal and state components of the research, extension, and education system has diminished significantly. Many universities have decreased their number of scientists and educators and significantly reallocated funds. Both federal and state funds have diminished (in real terms) since 1992.

Rationale for Federal Role in Research, Extension and Education. The future technological competitiveness of the food and agriculture system depends on three essential elements. If these are not provided through a combination of federal, state, and private funding, the technological and economic competitiveness of the sector will undoubtedly decline. In my view, these key elements are: a) basic research to better understand physical and biological principles that undergird our modern production and processing systems, b) application of basic scientific information to solving key problems through adaptive research and extension education, and c) development of highly educated and well-trained human resources. There is an important role for federal funds in each of these key arenas for the following reasons:

1. Federal funds are appropriate, and needed, to achieve national goals. The U.S. should be a world leader in developing basic, fundamental knowledge on which to anchor the practical and cost competitive food and agricultural systems of the next century. This should be a national priority. USDA should assure that its funds for basic research, both internally and through grant programs, are used in a manner that complements the basic scientific research programs of other federal agencies.

One could argue, however, that modern electronic communications could permit a nation to devise a reasonably sound agricultural research and technology policy without a basic or fundamental research effort. It might be possible, for example, to monitor basic research throughout the world and, through selective and highly effective applications, become the first adapter of those basic science developments that can be quickly applied to enhance the country's economic competitiveness. I do not believe this strategy is befitting the United States of America. We should be a leader in basic research and in its application to enhance the economic base of our food and agriculture sector. Our national policy goals should include being the world's leader in both the basic and applied research necessary to fully exploit the economic potential—domestic and export—of the nation's food and agriculture system. This is the position we have enjoyed throughout most of this century. We should not lose it.

2. Our national policy should also, in my opinion, assure that the nation has the best educated and best trained human resource base of any nation in the world Our leading land grant universities are recognized around the world for their excellence in education This excellence has been achieved through a balance of research and teaching. Federal funding for research, in partnership with the state funding to universities, has played an important role in achieving and maintaining this excellence. Students from around the world aspire to study at U.S. land grant universities. This is a tribute to the wisdom and leadership of the Congress in creating and nurturing this system in past decades. It is extremely important, in my opinion, that the U.S. retain this preeminent position.

3. A significant portion of the research carried out at universities and at USDA produces benefits that accrue well beyond state boundaries. These "spillover" benefits are significant, especially in crop and livestock production. It is unreasonable to expect a state to provide the funding needed to support such research programs at the optimum investment level when much of the payoff will accrue outside its boundaries. Federal funds and USDA involvement are important to help leverage the needed levels of research investments and to assure coordination and cooperation among state performers.

4. Some argue that research and education in agriculture can be privatized—if the federal government gets out, companies will pick up the slack. It is true that private sector investment in agricultural research has grown in the past decade. The National Center for Food and Agricultural Policy recently reported that private agricultural research and extension funding are about 45% of the nation's total. The balance is state, federal, and county-funded research and extension education, about ¾ of which is conducted at universities (1/4 is in ARS, ERS, and FS). A significant portion of private sector research dollars is spent to secure regulatory approval or to protect against potential product liability. While important, this research is generally not targeted toward advancing the frontiers of fundamental knowledge.

   Depending solely on the private sector for agricultural research and education would, in my opinion, alter overall research outcomes significantly. The goals of private sector research must, by necessity, be driven by a relatively short term goal of generating a profit from sale of goods and services. Public sector research is not so constrained and can lead to technologies that reduce levels of certain commercial products Research of this nature is not likely to be a high private sector priority. Examples are integrated pest management, soil conservation technologies, and environment-enhancing technologies. Without public funding, I believe there will be a technology gap. Only those technologies that enhance corporate sales of goods and services will attract research attention.

Mr. Chairman, I hope the members of the Subcommittee will carefully consider the positive impact of agricultural research, extension, and education on the future competitiveness of the American agriculture and food system. Federal funds will pay dividends in terms of building our storehouse of fundamental knowledge and in helping assure the economic competitiveness of the food and agriculture system. Regardless of budget pressures, we must do all we can to be certain that U.S. farmers and producers always enjoy the world-leading technology to which they have become accustomed, and that American consumers continue to enjoy the safest, most nutritious, and least costly food supply in the world.

CAST is dedicated to interpreting the latest scientific information in terms that are most useful to policy makers. Our success in doing so requires a good storehouse of scientific knowledge on which to draw and a broad cadre of scientific experts. I and other members of CAST would be pleased to work with the Subcommittee in any way that we can as you try to strengthen the nation's agricultural research, extension, and education system.

DR. ROBERT G. HELGESEN
CHAIR, NASULGC BOARD ON AGRICULTURE

Thank you, Mr. Chairman. I am Robert Helgesen, Dean of the College of Food and Natural Resources at the University of Massachusetts, one of your land-grant universities. I am here testifying in my capacity as Chairman of the Board on Agriculture of the National Association of State Universities and Land-Grant Colleges (NASULGC). I appreciate the opportunity to come before you to speak about the partnerships that make the land-grant system such a powerful and successful research, extension and educational network. This information network supports the 1.9 million farms across the U.S. that are expected to produce $200 billion of food and fiber and supports the vast food and fiber processing industries that add value to these commodities. It supports an economic sector that generates 23 million jobs, employs 17% of the U.S. work force and exports $58 billion to international markets.

With remarkable foresight, Congress created the federal land-grant system by passing three key Acts; the Morril Act of 1862, which established the land-grant colleges and guaranteed access to a college-level education for the agriculture community; the Hatch Act of 1887, which created the State Agricultural Experiment Station system and guaranteed the development of new knowledge and new technologies for agriculture through research; and the Smith-Lever Act of 1914 which established the State Cooperative Extension Service and guaranteed the transfer of these new technologies to the agriculture community. The network was enhanced in 1890 when Congress endowed 17 predominantly black colleges and again in 1994 when it added 29 Native American colleges to the land-grant system. The system presently includes 74 land-grant universities, 59 state and territorial agricultural experiment stations and cooperative extension services, a number of schools of forestry, veterinary medicine and home economics, as well as the aforementioned 1890 and 1994 institutions. What you have created is a vast knowledge network upon which our agriculture is built. I am proud to be a product of that system, having done my graduate work at North Dakota State University and Michigan State University.

Congress used great wisdom in securing a strong state-federal partnership by requiring that states invest in state agricultural experiment stations and state cooperative extension services. In all cases, the states have taken the endowment that was established by the original land-grant and, with the help of federal investments, built the prestigious state universities that each of us enjoys in our own states. Federal law requires each state to match dollar-for-dollar the formula-based federal funding appropriated for state experiment stations and state extension services; an appropriation equation that allows us to focus on state, regional and national research and extension priorities simultaneously. Quite appropriately, most states invest far more than the dollar-for-dollar match because they place so much value on research and extension programs at the local level. The unique balance between formula-based funding and competitive-based funding that you authorize and appropriate allows us to focus on specific priorities while at the same time maintaining high quality and highly productive programs. Since we are all vested in the knowledge network, we are really compelled to work toward its success.

I think it is useful to describe how that knowledge system works and what its critical components are. At the national level, our federal partner is the United States Department of Agriculture (USDA). The partnership between the states and USDA is facilitated by the Cooperative State Research, Education and Extension Service (CSREES). CSREES was recently organized from several former USDA agencies that seperately served the research partnership and the extension partnership. CSREES is a dynamic federal agency that brings together in one continuum the state and federal programs that create new knowledge through fundamental research, that adapt that new knowledge to new technologies for agriculture, that extend new technology to our stakeholders, through cooperative extension programs and that extend new knowledge to our classrooms.

CSREES maintains the federal guidelines for project establishment and review and termination. It facilitates the setting of national program priorities and it maintains a federal reporting system that is a critical database for our knowledge network. For example, CSREES is facilitating the development of the reporting system through which states will be able to comply with the 1993 Government Performance and Results Act (GPRA) while at the same time providing much better communications between the state partners. Regardless of GPRA, the state partners are most anxious to be accountable for the federal and state investments made in their programs, but it is difficult for us to do that at the individual state level. We are very hopeful that CSREES will have the means to develop an electronic reporting system that will serve the network and its individual state partners in being more accountable. In a certain sense, CSREES is the glue that holds our network together.

The National Association of State Universities and Land-Grant Colleges (NASULGC) is another means by which research, extension and teaching are coordinated at the national level. NASULGC is organized into councils, commissions and boards. The Board on Agriculture which I chair has five sections: Experiment Station Section, the Extension Section, the Academic Programs Section, the International Agriculture Section and the Administrative Heads Section, as well as an advisory council called CARET (Council on Agricultural Research, Extension and Teaching). CARET is made up of stakeholders from each state who help us establish national, regional and local priorities for the land-grant system and advocate on its behalf. Integrative issues between research, extension and teaching are addressed at the Board level. Just one example is the annual budget planning process where national priorities are set for these three activities. Dr. Charles B. Browning, Dean at Oklahoma State University, who testified before the House Committee on Appropriation earlier this year, chaired the Board's FY 1997 budget planning committee that included representatives from CARET and the five Board sections.

NASULGC provides a unique opportunity for the land-grant universities to reach consensus on national issues. A current activity that may interest some of you is the NASULGC Joint Futuring Activity, co-chaired by Dr. James R. Fischer, Director of the South Carolina Experiment Station, and Dr. Zerle L. Carpenter, Director of the Texas Agricultural Extension Service. The Board on Agriculture asked a select committee to conduct a futuring activity to help us chart a course for the next century. Their first major activity was a national scoping conference followed by regional listening sessions where our stakeholders could tell us what they valued and what they would like to see changed about our research, extension and education system. The first of these was the North Central Regional Listening Conference held at Kansas City, Missouri. It was co-chaired by Dr. Donald Uchtmann, Director of

Federal Extension Relations at the University of Illinois, and Dr. Richard Lower, Associate Director of the Wisconsin Agricultural Experiment Station. Progress on the Joint Futuring Activity is being reported on the world wide web and those of you who have access may be interested in following its progress: (http://members.aol.com/agriwash/nasulgc.html). I believe the Joint Futuring Activity will have major planning implications for our system.

Between the national and state levels, there is an elaborate regional organization of state agricultural experiment stations and state extension services that allow us to focus on issues of regional priority in the Northeast, North Central, Western and Southern regions. The trend in many of these regions is toward a closer integration of research and extension. In the Northeast, for example, we now have formed research-extension projects, called Northeast Research and Extension Committees. You will hear more detail about cooperative extension services when Dr. LeRoy Luft, Director of the Idaho Cooperative Extension Service, speaks to you in June. This morning you will hear more details about the state agricultural experiment stations from Dr. Paul Rasmussen, Director of the Utah Agricultural Experiment Station.

I have focused on the land-grant knowledge network because it is so unique and so powerful. Since we work together as state and federal, research and extension partners in this network, any new knowledge or new technology that bubbles up in the network is immediately accessible to anyone in the network to bring to bear on local problems. For example, breakthroughs in resistance to wheat rust discovered in Texas will have immediate implication and applications in Kansas or North Dakota. A new discovery in Oklahoma on an aspect of wheat rust and one in South Dakota on another aspect of wheat rust can immediately be pieced together toward the solution of a problem.

To me, it is the land-grant knowledge network that explains why we have been so successful, so quick with the development and implementation of integrated pest management programs for our major commodities.

On behalf of the Board on Agriculture, I want to express our appreciation for the investments you h ave made in that network and we look forward to working with you as partners in determining the national agenda that is best suited for our agriculture.

This concludes my testimony, Mr. Chairman. Along with the rest of the panel, I will be happy to respond to any questions from the subcommittee.

Testimony presented to the

House Agriculture Committee
Subcommittee on Resource Conservation, Research and Forestry
May 14, 1996

Research

Funding, Coordination, Priority Setting and Accountability

Dr. Paul Rasmussen
Chair, Experiment Station Committee on Organization and Policy

Mr. Chairman, Members of the Committee, I thank you for the opportunity to speak to the important research issues being discussed today. I am Paul Rasmussen, Experiment Station director at Utah State University and I Chair ESCOP, the Experiment Station Committee on Organization and Policy, of NASULGC, the National Association of State Universities and Land-Grant Colleges. ESCOP represents the Directors of the State Agricultural Experiment Stations.

On one hand, I am particularly happy to testify today because of the news that I do *not* have to report. Americans are not experiencing famine, widespread outbreaks of food borne diseases, or innumerable other agricultural-related problems that sap the economic vigor, political stability, and social vitality of nations.

On the other hand, I am worried about the future of a system that has served us so well for so long.

ESCOP responded to the fifty-seven questions sent by the Agriculture Committee to academic and scientific organizations. We appreciated the opportunity to participate in that survey. I will not address our written response to those questions. Moreover, since this Committee has heard from NASULGC's Board on Agriculture and will be hearing from my counterpart in Extension, I will focus on issues critical to agricultural research and research funding: coordination, priority setting and accountability. My full written testimony has been submitted for the record.

RESPONDING TO CHANGING INTERNAL AND EXTERNAL ENVIRONMENTS

The revision of Title XVI is an opportunity to recognize that "business as usual" is not the order of the day.

The definition of agriculture is becoming broader and the clientele served by the SAESs has grown accordingly. The consumers and taxpayers are our ultimate customers. "Research capacity" in nearly every state has eroded as much as 20 to 25% over the last five years. Although we have accommodated some of this reduction by restructuring, scarce resources jeopardize our ability to meet our goals.

The vast majority of our research is consistent with the Federal government's new agenda for agricultural research. We continue to eliminate unnecessary duplication and to share resources in regional research, which offers substantial improvements in effectiveness and efficiency. However, we must have a realistic perspective of what is possible given the scarce resources available.

FAIR-96 CAN CREATE NEEDED CHANGE AND PRESERVE HIGH PRIORITY PROGRAMS.

Your balanced budget initiative also offers an opportunity to modify policy to meet changing needs with limited resources. We are convinced that our research is a valid part of the new agenda for agriculture and can improve technology transfer. However, we can still improve linkages between partners.

Improved planning and policies should build on the unique strengths of the partnership between USDA and the State Agricultural Experiment Stations.

The University system is greatly influenced by local and state priorities. We use a "bottom-up" grass-roots approach. The Agricultural Research Service (ARS), appropriately tends tc take a more "top-down" approach. There is criticism that we do not adequately coordinate and collaborate between the two systems. We agree, and welcome the opportunity of exploring with this Committee ways to stimulate cooperation. One approach would be to ask the Secretary to have ARS and CSREES work with the State Agriculture Experiment Stations and State Extension Directors to develop a joint research plan. This plan could integrate the strategic plans of the Department, the seven year ARS plan and the four year State Agriculture Experiment Station plan. The joint planning process should, of course, recognize the autonomy of both the state and federal partners.

Client needs are changing. Reductions in farm programs will increase the demand for new technology and create new opportunities. Our research agenda includes methods to reduce or avoid both economic and environmental risk. Global competitiveness, the development of value-added agricultural products, a safer and more nutritious food supply are also part of our task. At the same time specialty crops, and rural development must be addressed. We must have the resources to capitalize on advances in engineering and the biological sciences germane to these areas.

The Farm Bill should create an opportunity to implement a general method of setting broad goals and priorities. The SAESs recommend that the Farm Bill provide general guidance for planning, establishing goals and priorities, and for assessing output and impact. The Bill should not be excessively specific, however, so partners can adequately address changing needs.

Congress has a role in defining broad political goals, and the USDA implements the requirements of the Bill. The SAESs and other Land Grant University partners share the responsibility in the development of goals and priorities. Customers have an advisory capacity. Clear and concise reports should be provided regarding progress.

DECREASING RESOURCES FOSTER THE NEED TO DEVELOP LINKAGES WITH OTHER AGENCIES.

The new Farm Bill should encourage a clear framework for agricultural research to address problems and opportunities characteristic of agriculture.

The Land-Grants and CSREES have a unique working relationship. The universities share with the Department the fiscal and legal responsibilities for overseeing research and extension programs. We have legal responsibilities for managing the funds that we receive through USDA/CSREES. We also have legal responsibilities to manage the funds we receive from state, local and other sources. The states typically provide two to three times the amount of funding for agricultural research than is provided by the federal government. So, when the universities plan with CSREES, it must be recognized that the states provide two-thirds of the national investment in agricultural research.

The problem that we face is that language in the recently passed Farm Bill does not recognize the unique partnership between the Universities and CSREES. We applaud the recent actions by Congress to exempt the Universities from FACA (Federal Advisory Committee Act). This was a very constructive action that eliminated unnecessary and inappropriate limitations on the collaboration among state and federal partners. As a next step, we encourage this Committee to develop legislative language to create clear mechanisms for the Universities and the Department to coordinate their respective budgets and research priorities and programs.

STRATEGIC PLANNING

A strategic plan should develop general goals, roles, and purposes for all federal and sate partners, including related extension and education functions. The reorganization of the USDA offers new opportunities to reexamine and redirect goals and priorities.

The strategy should include input from customers as well as administrators and scientists. Broad political and institutional goals, and relative priorities, should be established. Effectiveness should be measured through impact evaluation and assessment.

The research responsibilities of the partners warrant further clarification. Partnership should be defined according to shared resources, and a clear mechanism for shared decision making should be elucidated.

The decentralized SAES-USDA partnership permits effective and timely responses to national problems and opportunities. The Farm Bill should continue to allow this flexibility.

Customers, including urban constituencies, consumer groups and environmentalists should be involved in implementing and evaluating research. Such meaningful engagement will facilitate technology transfer. The NASULGC Board on Agriculture Futuring Activities entails an extensive listening process at state and regional levels to define customer perceptions.

CONDUCTING NECESSARY RESEARCH

Often people use the term "basic" or "fundamental" research to describe "cutting-edge" or "discovery" research. Discovery research is critical to develop the long-term knowledge base that keeps our country competitive. The terms "applied" and "development" research are used to discuss research that is more oriented to developing solutions and products that address more immediate problems. Sometimes a debate develops as to whether "basic" or "applied" research is more important. What we should be concerned about is doing the "necessary" research. We think that the strict classification of research as "basic" or "applied" is also a mistake. Types of research exist more as a "continuum". Research may be *more* basic or *more* applied. Moreover, what is "basic" today may be "applied" tomorrow.

Rather than slipping into an unproductive debate about the relative importance of "basic" and "applied" research, it is much more useful to reach some consensus on the critical issues that we need to address, and then talk about the mix of research activities necessary to solve these problems. Is it a problem that we know a lot about already? Then very targeted applied research may be most appropriate. Is the problem one that we don't know anything about at all? Then it may be appropriate to invest in longer term basic or discovery research. The point is that we need a research priority setting process, appropriate to the need under consideration.

AGRICULTURAL ADVISORY BOARD

The 1996 FAIR Act creates an Advisory Board of stakeholders that should be represented in the priority setting process. Now we should consider the membership of the Board. One Board may not be able to undertake all of the diverse challenges assigned by the Farm Bill. However, it is apparent that no single Board, whatever its composition, can provide for the broad mix of public input necessary to achieve consensus or ownership. Neither can it foster the dialogue regarding the mix of research required to solve specific problems. However, a Board can oversee a process required to accomplish these goals. A Board can ensure that the process is working fairly and effectively. It is the process that is critical.

Before new legislation on the Research and Education Title is drafted, we offer to work with the Congress and USDA to develop an appropriate process. We must integrate priority-setting at the local and state level, as well as at the regional and national level. You might consider directing the Secretary to work with the Land-Grant Universities to establish grass-roots "research and extension" listening sessions similar to those that already exist. Dr. Helgesen has described the regional activities of that type. We believe that this is an appropriate model for the State Agricultural Experiment Stations, the State Extension Services, CSREES and ARS.

ACCOUNTABILITY

The recently passed 1996 FAIR Act includes language that directs the Secretary to develop a "Management Information Systems" (MIS) to track and report research accomplishments. We encourage the Department to implement new computer-based reporting systems for research and extension. Some of our institutions are working with the Department to develop such an MIS. This system should include the following: First, the MIS should be integrated into USDA's activities which are consistent with the Government Performance Review Act (GPRA). Second, it should incorporate the existing CRIS system (Current Research Information System) so scientists can coordinate efforts and avoid duplication. Third, it should improve communication between research scientists, Extension agents, state program administrators, and administrators in Washington. Fourth, it should allow the Extension system to convey cutting-edge research findings to the public. Such a system should also include problem identification from the field to research scientists, but I defer to my colleague, Dr. LeRoy Luft, Chair of the Extension Committee on Organization and Policy (ECOP) to explore this issue further. Fifth, this MIS should build on geographic information systems (GIS) for use in establishing priorities. The Southern Region of State Agricultural Experiment Stations are developing a prototype system based on existing data bases and GIS systems that contain relevant agricultural information. They can overlay locations and research projects to better coordinate and integrate their state efforts. Sixth, the MIS should estimate "return on investments" in research and development. This is a very difficult task, but Dr. Thayne Dutson, the Dean of Agriculture at Oregon State University, has developed a computer-based system showing the rates of return on research funding for Oregon. If the Committee is interested, we could demonstrate the Southern GIS/MIS and the Oregon accountability system.

IN CLOSING

Mr. Chairman and members of the Committee. As with any system, there is room for improvement, and these improvements, when identified, are being implemented. Nonetheless, there is a point at which a lack of resources demoralizes an organization. We are approaching that point today. We are not plagued by mad cow disease, but there is potato blight, the Russian wheat aphid, jointed goatgrass, Karnal bunt disease and hundreds of other pressing concerns, many of which would not be addressed without federal support.

We have in place a system that capitalizes on individual initiative, fosters cooperation among local, state and federal agencies, and utilizes the tremendous infrastructure of our land-grant institutions.

We must not let crises dictate the allocation of funding. Prevention is much, much more cost-effective.

We commend you for your efforts to examine and improve our nation's agricultural research system. This is a critical issue not only for the research community, but for agriculture and the general public. We look forward to working with you and the Committee as you work through the challenging issues. I thank you for the opportunity to testify here today.

Statement of

Dr. Elizabeth D. Owens
Member, Committee on the Future of Colleges of Agriculture
in the Land Grant University System

Mr. chairman and Members of the Subcommittee, my name is Elizabeth Owens. I am honored to be here this morning to discuss the National Research Council's new report titled "Colleges of Agriculture at the Land Grant Universities. Public Service and Public Policy." I am a member of the NRC Committee on the Future of Land Grant Colleges of Agriculture that produced this report. Your hearing is the NRC's first opportunity to publicly discuss the report's findings and recommendations. It is a most welcome and appropriate opportunity. The NRC report is more broadly focused on the land grant colleges of agriculture and their tripartite mission of teaching, research, and extension. Nonetheless, a number of the conclusions and recommendations are directly pertinent to this hearing's more specific focus on federal funding of agricultural research.

Former Wisconsin Governor, Anthony Earl, chaired the NRC committee that produced the land grant report. Governor Earl is unfortunately unable to be here this morning due to a prior commitment. He asked that I extend his apologies for his unavoidable absence and that I represent the NRC on his behalf. It is my pleasure to do so.

Why did the National Research Council conduct a study of land grant colleges of agriculture? The National Research Council, as the operating arm of the National Academy of Sciences and the National Academy of Engineering, has a mandate to bring the best science that the academic community has to offer to bear on public policy issues. In fulfilling this mandate the NRC has long had a keen interest in the food and agricultural sciences and in the institutions that house and support food and agricultural scientists. The land grant colleges of agriculture--the 59 colleges produced by the 1862 Morrill Act and the 17 historically Black land grant colleges that derive from the 1890 Morrill Act--have trained most of the nation's (and indeed many of the world's) agricultural and food scientists. They employ more than half of the Ph.D. agricultural scientists in the United States. A study of the land grant colleges of agriculture was thus squarely within the NRC's scope of interest and responsibility.

The science and education agencies of the U.S. Department of Agriculture provided some of the financial support for the NRC study. Their leadership recognized the timeliness of an independent assessment of the land grant college system. It is a distinctly public institution that is unique within our nation's higher education system.

The NRC convened the 21-member Committee on the Future of the Colleges of Agriculture in the Land Grant University System in November 1993. The committee is composed of representatives of the land grant system (including those with administrative, teaching, research, and extension experience), the agribusiness industry, public interest groups, state government, and the nonagricultural science community (committee list attached). As NRC committee members we each participated in this study as volunteers. Our committee was charged by the NRC with assessing the adaptation of the land grant colleges of agriculture to the dramatic changes in society, agriculture, and, indeed, science that have occurred since the colleges' early years. Have their teaching, research, and extension programs kept up with and responded to the challenges of changing times? The committee was further asked to recommend public policy and institutional change that could enhance the colleges' contemporary role in serving the national interest.

Before I get into the substance of my presentation, let me briefly describe what the NRC is and how it works. I do this because is important for an understanding of the value of our recommendations. The Academy was chartered by Congress and signed into law by Abraham Lincoln. It differs from most other Academies of Science in the world in that it is not just an honorific Academy. From the outset it was established to provide independent advice to the government on matters of science and technology. It does so through the NRC, using thousands of experts from academia, industry, and other organizations who volunteer their time. During any given year more than 6,000 scientists, engineers, and other experts participate in our activities - most of them at the request of the federal government. The NRC actively strives for a balance of views among our committee members and subjects them to a conflict of interest review. The normal product is an independent consensus report. From initial approval of a study to this final report, every project is subject to oversight by supervisory boards and commissions within the NRC whose members are again, volunteer experts often members of the Academies. The final step in our rigorous quality control process is a review by outside anonymous experts who did not serve on the study committee. The sponsoring federal agencies have no role in the process and do not see a report until it is ready for public release.

The committee approached its charge in three stages. During the first phase, we collected, reviewed, and assessed public data and information about the colleges of agriculture, the teaching, research, and extension programs, and their changing operating environment. We also solicited the expert opinions of observers of and participants in the land grant system. This review resulted in our first descriptive publication, *Colleges of Agriculture at the Land Grant Universities: A Profile* (the *Profile* report), which was publicly released in September 1995.

During the second phase, in the spring of 1995, committee members held public forums in five states: Connecticut, Missouri, New Mexico, North Carolina, and South Dakota—and collected written comments from California residents, where a forum had been scheduled but canceled due to conflicting activities involving the Secretary of Agriculture. The goal of the forums was to broaden each committee member's personal experience with and exposure to a variety of land grant college campuses through up-close examination of the interface between college activities and public needs in five differing state and university environments. More than 500 individuals participated in the forums. In each state the forums drew significant attendance by college faculty and administrators, extension staff, farmers and ranchers, and representatives of commodity groups and agricultural industry. Although their numbers were fewer, among the participants were representatives of rural life and development programs, low income and ethnic minority groups, food distribution networks, health care agencies, and youth and education programs. The information generated by the forums was inherently anecdotal. Such information was not alone a solid basis for findings and recommendations on the part of our committee. Nonetheless, the forums enriched and complemented the more systematically constructed empirical portrait of the colleges and their changing context presented in our *Profile* report.

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The third phase of the study began in July 1995. From then through this last winter, the committee synthesized and integrated information from the first two phases. We then engaged in the deliberative process that resulted in the final report released to you today. Let me now turn to our key findings.

The committee's first major conclusion is that the land grant model is as relevant to the needs of contemporary society and today's food and agricultural system as it was in 1862 when almost 50 percent of all U.S. residents lived on farms. What does the land grant model imply? Harkening back to the Morrill Acts of 1862 and 1890 it means that higher education should be accessible to and inclusive of all citizens of ordinary means and relevant to advancing the economic status of those ordinary citizens. Harkening back to the Hatch Act of 1887 it means that scientifically sound research should underpin the teaching programs of the colleges and that the federal government should have an important role in supporting such research. And harkening back to the Smith-Lever Act of 1914 it means that the colleges' research programs should be linked to societal needs through a public service function we call extension, and that extension should be a cooperative partnership among federal, state, and local governments.

Our report attests to the continuing merits of an integrated mission of teaching, research, and extension--a framework designed to link science and societal needs. It is a model that is still keenly relevant for food and agricultural research--research that must be closely connected to society's most basic concerns and wants such as access to affordable, safe and nutritious food, the quality of the nation's natural resource base and its environmental amenities, and the quality of life in the nation's rural communities. And it is a model that continues to merit federal support. Indeed, our report's recommendations go toward strengthening this much-valued institutional framework.

The committee's second major conclusion is that while the land grant system has served the nation well--particularly through its highly significant contributions to farm output and productivity--changes are needed to reflect modern realities, challenges, and opportunities. Our committee recognized and applauds the efforts of many of the colleges to transform their teaching, research, and extension programs in response to the challenges and opportunities posed by the changing demographics of the nation, the growing complexities of the farm as a business enterprise, the increased public demands vis a vis the performance of the food and agricultural sector, and today's fiscal realities. It is the committee's belief that federal policy changes can enhance the process of change that has begun on many land grant campuses around the country in four principal areas:

Expanding the relevance and accessibility of the colleges' programs to a broad cross-cut of the American population.

Realizing efficiencies in the organization of teaching, research, and extension, particularly to reflect the regional and multistate characteristics of many food and agricultural system issues and problem.

Reinvigorating the linkages and synergy among the equally important missions of teaching, research, and extension.

And enhancing accountability and quality.

The committee developed 20 recommendations in support of these key themes, which are attached as a supplement to this statement. Six of the 20 are of particular relevance to this hearing. They call for changes in federal policy with respect to the funding of food and agricultural research.

1. The committee recommends that in setting research priorities, land grant colleges garner regular and effective input from a wide variety of stakeholders. *In fact, we further recommend that receipt of USDA-administered funds for research (and I am speaking now of all USDA-administered funds, including those allocated by formula, special grant, or competitive grants programs) be contingent on the demonstration of such input.* We make this recommendation because land grant colleges have a responsibility, based on their philosophical roots and legislative mandate, as well as their broad base of taxpayer support, to conduct and disseminate research that is relevant and accessible to the general public. Many of today's food and agricultural system beneficiaries, such as consumers and environmental interest groups, have had relatively little knowledge of or connection to many of the colleges. These connections, which are being strengthened in some parts of the country, must continue to be enhanced. Enhancing these connections does not mean abandoning farmers. It means building a broad constituency for research programs that respond to and enhance complementarity among the nation's multiple goals for its food and agricultural system. Enhancing connections to both farm and nonfarm residents is an outcome crucial to extending the colleges' relevance into the 21st century.

In fact, the land grant colleges must be ever-more attuned to the complex needs of a diverse farm, ranch, and agribusiness clientele. All farms--large-scale, commercial farms to small-scale specialty farms--and all farmers--of all different economic means, educational backgrounds, and research capacities--are important to the nation's economy, competitiveness, and quality of life. Although a small share of all farms produces most of the food and fiber that enter commercial marketing channels, smaller and medium-sized farms manage de facto the nation's resource base, bring vitality to rural areas, serve consumers' growing demands for direct-marketed and speciality products, and contribute to biological and technological diversity in the food and agricultural system. It is a challenge, but the research portfolio of the land grant system must increasingly reflect the diversity of needs among farms of different scales and production technologies, and among farmers of different educational backgrounds, technological expertise, economic means, and status as owner, operator, or contractor.

2. *The committee recommends that significant shares (for example, 25 percent or more) of current USDA-administered extramural funds for food and agricultural research, extension, and teaching provide incentives for programs and projects that integrate and mobilize multistate and multi-institutional resources.* Today there are many good reasons for bringing organizational efficiencies to the land grant system, for moving away from a state-by-state

approach that too often promotes duplication and inefficiency and toward regional and multi-institutional approaches that can capitalize on the specialized strengths of the institutions involved. The committee referred to multi-state and multi-institutional partnerships as a "new geography" for the land grant system.

The case for a "new geography" rests on a number of finding. One is that states are often not the best unit of organization or operation for food and agricultural research issues and problems Improving water quality, for example, may require the coordinated approach of several states sharing a watershed. Another is that in the face of fiscal constrains, a broadened agenda for food and agricultural research--one that reflect the broad and diverse interests of the American public--requires more efficient use of resources within the land grant system. Other reasons are the merits of partnerships for smaller, less well supported institutions in the system and the opportunities for inter-institutional collaborations offered by modern technologies such as videos, telecommunications, and the Internet.

3. *The committee recommends that federal formula funds for research and extension be combined into a single allocation. We further recommend that 50 percent of those combined funds be used to support programs, projects, and activities that explicitly bring together teaching, research, and extension or, alternatively, the work of multiple disciplinarians.* We make this recommendation because the committee found that the separate administrative and funding structures organized around teaching, research, and extension too often work against rather than in the interest of a balanced, integrated tripartite mission. Combining these two formula-based funds and devoting a significant portion to "integration grants" would help convey the message that the values of research and extension are enhanced when the two work together as inter-related components of a single mission.

4 *The role of competitive grants in food and agricultural system research--allocated through peer review on the basis of scientific merit and relevance--must be expanded.* This recommendation has two parts: First, we recommend the funding level for competitive grants for food and agricultural systems research should be no less than the $500 million authorized by Congress for the National Initiative for Research in Agriculture, Food, and the Environment (the NRI). The committee makes this recommendation because it believes the relative lack of competitively awarded research specific to food and agricultural issues places severe limitations on the ability of the land grant system and other research institutions to meet the research challenges of the future.

Second, we recommend increasing the share of federal research funding that is awarded competitively to projects and individuals on the basis of peer review. Arguments can be made for and against both formula based funding to institutions and competitive grants to individuals and projects--each comes with benefits and costs, which we discuss in greater detail in our report. However, some of the early reasons for formula funding of state agricultural experiment stations, such as the need to draw each state and territory into agricultural research and the site-specific nature of agricultural research, carry less weight today Today most states provide far more financial support than is required to match the federal dollars, and many types of food and

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agricultural research, such as nutrition, food safety, and biotechnology, have little or no location specificity. Other arguments for formula funds, such as the ways they can be used to link research to extension programs that respond to local, state, and regional needs, and their support for certain applied research projects that require long term continuity, remain quite compelling. Despite its uniqueness, the committee believes agricultural research needs to enhance quality, accountability, and equity through greater use of competitive allocation mechanisms.

The last two recommendations I will highlight today address the future use of formulas as a continuing though less important means of funding food and agricultural research.

5. *The formula by which food and agricultural research funds are allocated within the land grant system should be revised.* The committee believes the current formula, which is based largely on a state or territory's percentage of the nation's farm and rural population and which has not changed for many decades, fails to reflect the broadened contemporary constituency for food and agricultural systems research. Current and future research is neither just--nor even primarily--for the benefit of farmers and rural residents. Although this fact is reflected in the changing names of many colleges of agriculture, it is not reflected in how funding formulas are calculated. The committee stresses that the new formula--and many possibilities should be studied before a new formula is chosen--should be applied to total allocations among states and territories, not limited to annual, incremental increases.

6. *The federal government should require that states match federal formula funds going to the historically Black 1890 institutions in the same manner as is required for 1862 institutions.* Federal legislation requires that state governments match the federal formula-based contributions to research conducted at the experiment stations located at 1862 institutions; in fact, states contribute far more than their matching requirements. However, no such requirement applies to federal contributions to research based at the 1890 institutions. Aside from the obvious inequity among institutions within the land grant system, this discrepancy in federal funding requirements also means that the clientele of the 1890 institutions are less likely than the clientele of the 1862 colleges to receive adequate research attention. The 1890s have been uniquely focused on issues, problems, and needs of African American and other ethnic minority groups, small-scale and limited-resource farmers, and low-income rural and urban families. Thus the committee's recommendation is meant to enhance the vital role of the 1890s as providers of access to under represented segments of the population. Although the committee recognizes the possibility that a few states may refuse to match federal funds, we feel that the time for this recommendation has come.

Thank you very much. I would be happy to answer any of your questions about these or other recommendations in our report.

JOSEPH D. COFFEY
CHAIRMAN

Part I -- Introduction

Thank you, Mr. Chairman. My name is Joe Coffey. I am testifying in my capacity as Chair of the Council for Agricultural Research, Extension, and Teaching (CARET). CARET is a national grassroots organization created in 1982 by the National Association of State Universities and Land-Grant Colleges (NASULGC). CARET's sole mission is to: *enhance national support and understanding of the land-grant university food and agricultural research, extension, and teaching programs*.

I am Vice President of Economics and Planning of Southern States Cooperative, Richmond, Virginia. Southern States is a regional farmer-owned and controlled cooperative that serves a million farm and rural families in the six states that surround this nation's capital. Southern States supplies a billion dollars of feed, seed, fertilizer, fuel, and 45,000 other products through a network of 500 stores.

CARET and our land-grant universities appreciate this Subcommittee's support of agricultural research, extension, and education programs and your continuing quest to make the best agricultural research and education system in the history of the planet even better. We especially want to acknowledge the extension of the research title of the farm bill and the addition of $300 million over a three-year period to the Fund for Rural America, of which one-third or more is for research, education, and extension programs.

Part II -- The Questions

Time is short, so I will skip further pats on the back and go directly to two key questions I will address:

1) *Why should the federal investment in agricultural research and education be increased?*

2) *What are the priority recommendations for increased research and education?*

Part III: Why? The Case for Increased Federal Investment

1) **Food is fundamental** -- three times a day and will continue to be for many, many years to come. Despite my optimism about the technological breakthroughs in agriculture, we will not soon be displacing farm produced food with pink pills produced on an assembly line or green goo from a hydroponics process. Thanks to breakthroughs in biotechnology, someday pharmaceuticals, fibers, energy and other necessities for human life, now produced in the factory, may be produced on the farm.

2) **Food and agriculture sectors and their related industries provide almost 20% of**

U. S. jobs and account for 16% of gross national product. Agricultural exports will generate a record $61 billion of foreign currency in 1996 and will help reduce our trade deficit.

3) **Publicly-funded agricultural research generates huge payoffs to society.** Study after study has consistently documented that agricultural research and education are not an expenditure, but a long-term investment with a high pay-off to society. For example, in my state of Virginia, a one-dollar increase in research boosts agricultural production $9 over 12 years.[1] One of the most frustrating ironies we face is that the measured returns to investment in agricultural research are so high that we have a hard time of convincing Congress and the public that they are credible.

4) **Private and public research are not competitors, they are complementary.** Private research, by necessity, tends to be more narrow and short term. In contrast, public research can be more speculative, broader, and longer term and deal with such issues as environmental quality. The issue is not one or the other, but both. According to the most recent data, in 1992, $6.3 billion were spent on agricultural research, of which 60% was private sector, 25% federal, and 15% state. The private sector recognizes the value of land-grant research and has been a major supporter. As the recent GAO report states: "Private sector funding [of agriculture research at land-grant universities] more than doubled over the [1975-94] period, from about $196 million to about $418 million in constant 1994 dollars.[2]

5) **Agriculture is becoming increasingly sophisticated and productive.** Some 40 years ago when I was milking, by hand, a herd of 6 cows in a dirt-floored shed, dairying was strenuous, but simple. I had no computers to program nor meters to monitor. I gave each cow a coffee can full of ground corn, stuck my head in her flank and gave a yank. Of course, the whole herd gave less than some individual cows do today. I should add, the price the consumer paid for milk in inflation-adjusted terms was probably double or triple what it is today. Yes, agriculture success may have once depended upon grit and grip, but today it depends upon science and technology.

6) **We are at the brink of many promising breakthroughs in agricultural sciences, which can pay big dividends to future generations.** These publicly-supported programs are crucial to help us retain and expand our competitive edge in the global marketplace, while maintaining the proper balance with human and environmental concerns. Public agricultural research, extension, and education will enable us to produce better and safer foods, find new uses for agricultural products, minimize the use of potentially harmful chemicals, and curb deterioration of our natural resources.

7) **Duplication of effort and lack of coordination is much less of a problem than is often alleged.** Research proposals go through an intensive review process to make sure the project does not duplicate research already underway or completed. Moreover, many agricultural practices are site specific and require adaptation to the locality. Those who

allege duplication, not only underestimate the variability of agriculture, they also overestimate the ability of some central planner to do a better job than our present decentralized land-grant system which is closely linked via Extension to the grassroots level. Professor Theodore W. Schultz, a world-renowned economist and recipient of a Nobel prize, has observed: "Agricultural research in the United States has been spared the potential serious inefficiencies of a highly centralized funding and control. Decentralized decision making has become an important attribute of U. S. agricultural research. . ."[3]

8) **Improved communications and computer techonlogy are boosting the efficiency and effectiveness of knowledge workers.** They facilitate multi-disciplinary and multi-site research collaboration, reduce the layers of management and administration required, lessen time and expense of travel, enable interactive discussions of people at scattered sites, hasten the dissemination of the results, provide on-line instantaneous access to massive electronic libraries of information, and, last but not least, save trees.

9) **Key to the success of U. S. agricultural research is the synergy of the close working relationships of extension, teaching, and research at our land-grant universities.** Knowledge has little value if out-of-date or cloistered on campuses or walled-up in Washington. But, when constantly brought up-to-date and put to work on our farms, communities and homes, can work wonders. The Cooperative Extension Service, as the title suggests, is to cooperate, extend, and serve. Extension is not a line federal agency that commands and controls. Rather, as the word cooperative suggests, Extension helps people to "work or act together willingly for a common purpose." Extend not only means to transfer or communicate. Extend also means to "enlarge or make more comprehensive." Extension professionals, not only accelerate the flow of information, they contribute to it and adapt it to local situations. Extension also plays a crucial role in assisting people, communities, and businesses to identify their problems and communicate them to the researchers and back on campus. The surveys conducted by GAO confirm the widespread agreement of the advantages of research, teaching, and extension professionals working together on our land-grant campuses. By using the same faculty for research and classroom instruction, we are guaranteed that the very latest, most exciting and most relevant information is presented to university students -- our future leaders.

Part IV: What? -- Priority Recommendations

1) **Make agricultural research, not just a two-year title in the farm bill, but a core component of our long-term agricultural policy.** This is our first and foremost recommendation. U. S. agriculture has two choices of how to compete in the global market. We can either work for a lower wage than anyone else in the world or we can work more productively. Obviously, we want to work productively, not for pittances. As we and other countries transform from a less government-controlled agriculture toward a more market-oriented one, our agricultural research will become more strategic than ever to our success.

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2) **Maintain and strengthen the base programs funded by the Hatch, Smith-Lever, and related legislation at the land-grant system.** These base programs are designed to maintain and enhance the core competencies so that we have the capacity to respond to a mad-cow scare, a sudden death syndrome in turkeys, a flood along the Mississippi, or Karnal Bunt outbreak in Arizona. You cannot fight a fire with an empty hose, and more importantly, you cannot prevent it without knowing what caused it. Not only do the federally-funded base programs at the land-grant colleges provide the core competency, they also are seed money, which is used to leverage matching state, local, and private funding. Each dollar of federal funding leverages $4 to $5 of non-federal funding.

3) **Competitive grants have an important role but should not be relied upon exclusively.** Competitive grants can be used to attract the top talent to focus upon a specific area. But they presuppose that talented researchers are in the wings waiting to spend time writing proposals. More importantly, the advantage of competitive grants presupposes that the subject selected has the greatest pay-off to society. It would be interesting to learn how many of the agricultural research projects with the greatest pay-off to society were from competitive grants and how many were from base programs. The success of government agencies, even the once vaunted but now disparaged Japanese Ministry of Trade (MITI), at picking high pay-off winners is not very high. Competitive grants may have more sizzle, but the base programs are the real steak. As we will now argue, incentives, information technology, and active involvement of agricultural leadership are secrets to success.

4) **Strengthen research evaluation and rewards.** We need to base public funding of agricultural research on measures of the anticipated value to society. What we need, in the words of Dr. Robert L. Thompson, President, Winrock International, is "for researchers and research administrators to answer two fundamental questions. . . Who cares? and So what?"[4] Rewards and incentives should not be based on counting publications, presentations projects nor competitive grants, but on measuring results. Nor, as Dr. George Norton, a recognized international expert in research evaluation warns, "formal evaluation and priority setting procedures should not be used as a basis for replacing ingenuity, serendipity, and scientific entrepreneurship with costly bureaucratic procedures."[5] Indeed, I am concerned about the inordinate number of studies, strategic plans, hearings, etc. currently underway. I receive more invitations to research and extension evaluations than I receive credit card solicitations. Agricultural research needs more investments and less inquisitions.

5) **Invest in information technology.** USDA's present research and information system is woefully inadequate.[6] An improved system, along the lines being proposed by USDA[7], which would enable both public and private researchers to quickly find out what research has been done, what is underway, and who is doing it, would do more to reduce duplication, fill voids and foster collaboration than any coordinating committee could ever concoct.

6) **Increase federal funding of agricultural research and education programs.** I disagree with the view that federal budgets are too tight and that we therefore cannot afford to invest more in agricultural research and education. Budgets are not too tight, spending is too loose and priorities too vague. Federal support is slipping. Currently, we are investing only 2 pennies in federal agricultural research, extension, and teaching per dollar of food and fiber expenditures. Real (inflation-adjusted) federal funding of agricultural research and education programs at the land-grant colleges has declined 15% in the past five years alone. There has been a 20-25% reduction in the research capacities of the land-grant universities in the past 5 years.[4] One of the frustrating ironies we fight is that the measured returns to investment in agricultural research are so high that we have a hard time of convincing Congress and the public that they are credible.

7) **Continue to support and strengthen the land-grant university system as our unique invention to create inventions and opportunities.** This network of 75 universities works in close cooperation with federal, state, and local agencies. Each year the land-grants' 24,000 professionals: a) educate 100,000 students, b) reach out to 40 million Americans, and c) identify, generate, and extend literally millions of dollars of advances in agricultural productivity. The winning combination of research, education, and extension is needed today more than ever.

In conclusion, Mr. Chairman, the opening of global markets, the modernization of farm programs and the promise of scientific breakthroughs, offer us an unprecedented opportunity to capitalize upon increased federal investments in agriculture research and education. Thank you for the opportunity to present CARET's position. I would be happy to respond to any questions the Subcommittee members may have.

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1. George Norton, Professor of Agricultural and Applied Economics, summary of comments in The Council on Food, Agricultural, and Resource Economics, *Agricultural Research Assessment -- A Symposium Summary*, Greenbelt, MD, 1996, page 14.

2. United States General Accounting Office, *Agricultural Research: Information on Research System and USDA's Priority Setting*, March 1996, p. 23.

3. Theodore W. Schultz, Foreword, in Wallace E. Huffman and Robert Evenson, *Science for Agriculture -- A Long-Term Perspective*, Iowa State University Press, Ames, IA, 1993.

4. Robert L. Thompson, President, Winrock International, summary comments, The Council on Food, Agricultural, and Resource Economics, *Agricultural Research Assessment -- A Symposium Summary*, Greenbelt, MD, 1996, page 7.

5. George Norton, Professor of Agricultural and Applied Economics, summary of comments in The Council on Food, Agricultural, and Resource Economics, *Agricultural Research Assessment -- A Symposium Summary*, Greenbelt, MD, 1996, page 13.

6. The recent GAO report documents the deficiencies.

7. Statement of Dr. B. H. Robinson, Administrator, Cooperative State Research, Education, and Extension Service before the Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies, March 20, 1996.

8. Gary Mitchell and John Goldberg, Agricultural Research Questionnaire Summary, U. S. House of Representatives, memo dated January, 4, 1996.

Testimony of the Institute of Food Technologists

Sustaining Federally Funded Agricultural Research

by

Barry G. Swanson, Ph.D.
Professor, Department of Food Science and Human Nutrition
Washington State University
to
U.S. House Committee on Agriculture
Subcommittee on Resource Conservation, Research and Forestry
on
May 14, 1996

Good morning. I am Barry Swanson, Professor of Food Science and Human Nutrition at Washington State University and Chairman of the Research Committee of the Institute of Food Technologists (IFT). IFT is a scientific society of 28,000 food scientists and others working in related professions in academia, industry and government. I appreciate the opportunity to represent the Institute of Food Technologists today and present testimony on publicly funded food and agricultural research.

America invests approximately $70 billion annually to conduct research and development in federal laboratories, academic institutions, independent research organizations, and industry (1). Just 2% of this investment - some $1.5 billion - is directed toward agriculture, the enterprise that feeds, clothes and shelters people in America, and increasingly, around the world, as our produce and value-added products expand their share of world markets. With states contributing an additional $981 million, the total public sector investment in agricultural research approximates $2.5 billion (2).

Public investment in agricultural research is critical to the development of new knowledge, new technologies and new applications upon which modern agriculture depends. It is public investment that supports the research and trains the minds that solve the problems of plant and animal diseases that threaten agriculture, diseases such as karnal bunt fungi on wheat, late blight on potatoes, and BSE, the "mad cow" disease. Through research comes the understanding of how new pathogens such as *Escherichia coli* O157:H7 emerge, how to detect infectious agents quickly, and how to guard against them. Agricultural research leads to improved agronomic methods that protect soil, water and ecosystems. Agricultural research points the way to value-added products such as potato granules and concentrated fruit juices. And agricultural research leads to new technologies such as modified atmosphere packaging and high pressure preservation of foods, which are part of the $494 billion value-added food system (3).

Publicly funded food and agricultural research is accomplished through in-house research conducted by the Agricultural Research Service in some 128 laboratories throughout the U.S. and overseas, and through state agricultural experiment stations, and colleges of agriculture, forestry and veterinary medicine in land grant universities across the country (2). Agricultural research dollars not only pay for research grants, but also support extension, technology transfer programs, higher education, and research facilities.

In addition, the private sector invests some $3.8 billion in food and agricultural research and development, of which approximately 10% finds its way to state research institutions (2). Most private sector research, however, is spent on proprietary product development and testing.

America's agricultural research system is enormously successful on many fronts, but four achievements in particular warrant mentioning. First, agricultural research is successfully creating and expanding the knowledge base for food and fiber production. Second, agricultural research is meeting specialized local and regional agricultural needs and communicating research findings to farmers and users of agricultural products. Third, agricultural research is fostering new technologies to protect, process, and distribute agricultural products. Fourth, research underlies the creation of new, value-added products for world markets. We see and sometimes take for granted the results of agricultural research, often without recognizing the research behind the achievements. It seems that shrinking America's investment in agricultural research is both untimely and imprudent.

The fact that research and technology needs of modern agriculture have not made their way to the priority lists for either science or economic investment has several consequences. One is that the applications of biotechnology for developing safer alternatives to agricultural chemicals will be impeded. Another is that strategies for decreasing soil erosion, nutrient depletion, and soil salination will be delayed, risking further compromise of the environment. A third is that improvements in the nutritional profile of edible plants and other foods will be set back. Fourth, there will be unnecessary delays in the detection and deterrence of foodborne pathogens. Fifth, the applications of research knowledge to problem-solving technologies and the development of value-added products will be diminished.

Food and fiber researchers understand that in times of budget austerity, priorities must be set with great care to assure vital food security, agriculture production and development, food safety and human health, and environmental protection. Research programs must be scrutinized for scientific merit, pertinence to agriculture needs and goals, and redundancy. IFT urges that improvements in the overall agricultural research enterprise be sought to: 1) refine long-term goals; 2) set priorities for research that heed the needs of producers, processors and consumers; 3) foster imaginative solutions to problems through team-building partnerships, collaborations, and closer ties with land grant universities; and 4) transcend short-term political goals for long-term, strategic accomplishments. Agricultural research is a bipartisan investment in the strength, ingenuity, human welfare and economic competitiveness of America. Agricultural research also benefits the ever-growing food needs of the world.

Meeting the research challenges facing America's agricultural system requires that we educate the best minds in a framework designed to produce the best science, stimulate innovative technologies and foster cutting-edge applications. As in medicine, agricultural research relies on federal laboratories as well as land grant universities and other institutions to conduct research. Land grant universities derive their funds in many ways, including direct grants, formula funds, competitive grants, special or "earmarked" projects, and special appropriations.
While each type of funding has its merits, it is widely acknowledged within the scientific community that competitive merit review by external peer reviewers produces the highest quality science. In agriculture, the National Research Initiatives Competitive Grants Program, popularly known as the NRI and administered by CSREES, is designed and implemented with peer reviews. The NRI is vital to the development of fundamental knowledge in food and fiber sciences, yet at an appropriation of $100 million, the NRI represents only 0.06% of USDA's total research funds.

IFT is pleased to note and support the Administration's budget proposal for USDA research which includes an increase of $33 million for the NRI program. IFT believes that the agricultural sciences will be strengthened and better served by expanding the system of competitive grants based on merit and peer review.

IFT further acknowledges the world class research from ARS laboratories in spite of declining funding that becomes apparent when costs are compared with funding increases (2). ARS research also supports the needs of USDA regulatory services, FSIS and APHIS. As USDA increases its emphasis on science-based food safety inspections, the demand for data to develop sound policies is especially acute. Current awareness of food safety problems illustrates the need for the agency to be flexible and responsive to emerging research needs. It appears appropriate however, in times of funding constraints and aging facilities, that efforts to consolidate and close some ARS facilities be reinvigorated and ties with land grant universities be strengthened.

The Cooperative State Research, Education and Extension Service (CSREES) provides partial funding to land grant colleges and universities, state agricultural experiment stations and other institutions for research, higher education and extension services. These funds help create strong colleges of agriculture throughout the country and ensure a pool of talented agricultural scientists for today and tomorrow. CSREES' investment in land grant universities fosters food and fiber research relevant to local and regional needs and ensures the transfer of knowledge to constituents and local communities.

Coordination of research priorities and initiatives within USDA must ensure that research funds are directed to priority needs and are responsive to emerging scientific and public policy needs. Current funding mechanisms may not result in the best science being directed at the most urgent research needs. Carefully targeting research investments will increase the probability of finding solutions to the complex, long-term challenges confronting America's food and fiber system.

Agricultural research needs are changing dramatically. We are seeing a rapid decline in the numbers of farmers and ranchers. We are seeing changes in the methods of agricultural production Domestic and world-wide markets for raw and value-added products are evolving Public perceptions of the costs and benefits of agriculture are changing To ensure that America's food and fiber system not only remains strong but is forward thinking, it will be necessary to 1) re-examine food and fiber research needs and benefits, 2) set priorities that include both scientific and societal concerns, 3) communicate agricultural issues to a public largely oblivious to and disconnected from agriculture, and, 4) devise imaginative team strategies for tackling problems and applying results

Research will not solve all problems What agricultural research can do is provide the knowledge that leads to information, technologies, superior products and economic competitiveness that characterize America's agricultural system America's agricultural research system has repaid its public investment many fold Sustained investment in agricultural research will enable us to continue to reap the benefits in knowledge, technologies, products and markets

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210 A

Statement of

The American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America

before the

U.S. House of Representatives
Committee on Agriculture
Subcommittee on Resource Conservation, Research, and Forestry

May 14, 1996

Submitted by

C. Jerry Nelson, Ph.D.
President, American Society of Agronomy

Good morning, Mr. Chairman and members of the Subcommittee. First, allow me to express my appreciation for the opportunity to testify before you today on the critical importance of agricultural research funding. A complete statement has previously been submitted to the Subcommittee. At this time, I will summarize the portion of that statement which is pertinent to this hearing.

My name is Jerry Nelson. I am a Professor with the Department of Agronomy, University of Missouri, Columbia. I testify today on behalf of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, which are non-profit scientific and educational organizations often referred to as the TriSocieties. The TriSocieties have over 12,000 active members and serve over 10,000 certified professionals. A major goal of the TriSocieties is to promote effective agricultural research. Therefore, it is an honor to provide this subcommittee with testimony concerning research funding.

Research Funding

The Importance of Research

We support the efforts of this Congress to balance the federal budget. We know this is a difficult task and requires many challenging decisions. It is precisely at these times, when government spending is being reduced, that an increased commitment to federally supported research and development is most critical. Investment in research and development lays the foundation for recovery and a rebounding economy in the future. Accordingly, as more traditional funding mechanisms for supporting commodities and farm groups are being restructured, *it is essential that the investment in agricultural research and education be increased to assist farmers and ranchers remain competitive through these transition times and to provide the tools the agricultural community needs to stay at the cutting edge of an increasingly challenging global market.*

The federal government must foster and support a strong and viable agricultural sector that is able to meet the food and fiber needs of the American people. Similarly, the federal government has unique responsibilities for supporting the research and education infrastructure that supports our agricultural producers and processors. The accomplishments of U.S. agricultural research are deservedly well-heralded. Rates of return on agricultural research range from 25% to 50% depending on the crop and the location. In brief, agricultural research has resulted in more than a doubling in general farm productivity between 1950 and 1990 while requiring less than one-third the labor. The main beneficiary of this enhanced efficiency is the American consumer who has a consistent, abundant, safe, and affordable food supply.

Challenges and Opportunities for Agricultural Research

Expectations for agricultural research are changing. Expanded research and development are needed to enhance international trade and global competitiveness of U.S. agricultural enterprises.

Over the past 25 years, agricultural exports have helped decrease the U.S. trade deficit by generating more than $100 billion annually in U.S. business activity. Reduced restrictions for international trade and the growth in size and affluence of developing countries have resulted in even higher agricultural export levels. However, despite the overall increase in agricultural exports, the U.S. share of the world market is declining.

We need to increase our export of processed food products with high value added. Research activities directed at product differentiation, enhancement of quality, managerial expertise, and industrial innovations, and many other considerations are essential to the manufacture of consumer-ready products to help the U.S. remain competitive in the global market.

As agricultural researchers, we recognize that more than 75% of the total U.S. population resides in urban or suburban areas. Public interest groups have become increasingly involved in agricultural issues and are calling for a higher degree of attention to the problems of rural communities, environmental concerns, and consumer issues.

These international and domestic demands provide new but achievable challenges for the agricultural and environmental research community. We are presently in the midst of scientific and technological innovations which provide unprecedented opportunities through food and agriculture research. Achievements in plant and animal genetics have given us a better understanding of growth and disease processes. Advances in molecular genetic techniques or biotechnology provide unlimited opportunities for improving pest resistance, quality, nutrition, and value-added potential.

Efficiency and Effectiveness of Agricultural Research

As already stated, the TriSocieties strongly support agricultural research and would not favor any reductions of its funding. However, we would like to offer some ideas which might improve the efficiency and effectiveness of agricultural research.

1) Priority Setting

Priority setting for agricultural research should involve a "bottom up" approach. Agricultural research that is supported by USDA and the Land-Grant Universities serves a number of clients and customers including farmers, processors, commodity groups, farm groups, agribusiness, environmentalists, and public interest groups. A bottom up approach requires input from all these sectors to identify the needs/issues to be addressed, to synthesize a consensus, and to develop a context of a national priority system.

We acknowledge the creation of the National Agricultural Research, Education, and Economics Advisory Board. We urge that nominees be selected who will ensure grassroots input from a broad range of clientele groups. We are pleased with the potential involvement of representatives from professional scientific and education societies. To enhance the Advisory Board's effectiveness in fulfilling their duties, we encourage the Board to obtain input from local, state, and regional sources as well as from ad hoc planning and prioritization groups from associations and scientific societies. Such groups can be effective in planning and prioritizing issues because they are better able to address specific problems. The National Board can best work at identifying common denominators across the system. Although we strongly support stakeholder input for identifying problems and establishing priorities, we encourage maintaining an effective peer review system for individual programs and projects. We caution against developing a review process that will overly encumber the research system.

2) Define the roles of the Agricultural Research Service, the State Experiment Stations, and Industrial R&D.

The federal government has a vital role in supporting the continuum of basic through applied research. Research cannot be easily defined as basic or applied although we all have a sense of what these terms mean. Funding of research is extremely dependent on the knowledge base of a given discipline or possible solutions to specific problems. When the knowledge is low, more priority should be placed on basic research; conversely, when the knowledge base is well-established, funding needs to be directed at more applied sciences to adapt the findings into systems.

Federal research should focus on areas of national importance to agriculture, for example, plant and animal germplasm acquisition, enhancement, and preservation, and on plant and animal genome mapping. We support the ARS mandate to identify and to conduct research with broad national or regional benefits, as compared to the more local returns expected from state research institutions. ARS also provides the opportunity for long term and higher risk research that applies to national or regional problems. State experiment stations also contribute to basic research and have responsibilities for graduate education and post-doctoral training, both major benefits from research funding.

Effectiveness of research can be enhanced by keeping the area focused on real problems and by conducting the applied research in the regions of adaptation and utility. Fundamental research can be conducted anywhere, but research on applying and integrating the technology needs to be conducted in areas of the need. These needs and the applicability of the research for that problem can be best determined locally. Thus, another role of the state experiment stations is to complement and not compete with the federal effort. Efficiency could be improved through increased cooperation and coordination of federal labs and state experiment stations. For example, funding of joint projects will greatly encourage and foster true cooperation.

The amount and type of industrial research and development is inherently linked to the profit potential of a particular product or technology and, as such, is normally short term in nature. Partnering and cost-sharing should be encouraged among the private and public sectors by initially including private interests in areas of public-funded research which seems promising for industrial application. Federally funded research, then, should continually shift to more fundamental areas as research on developing applications is transferred to industry.

3) Streamlining research costs

Research costs can be reduced by enhancing technology flow within the research community. New models of cooperation involving practioners and interdisciplinary teams, including basic researchers, help focus the effort and shorten time to adoption. Funding sources have generally favored individual investigators and disciplinary approaches which are good for basic research such as that of NSF. Focusing on solving problems increases efficiency, but requires problem definition. This can best be done with inputs at the regional or state levels by persons who are familiar with the strategic issues.

A proportionate share of the federal funding should be made available for competition at regional or multi-state levels. Commodity interests and industry can play a major role in determining the priorities and leveraging the federal investment. This also allows focus on the specific. For example, tillage is critical for both corn and cotton, but the best evaluators for measuring success are markedly different.

The grant proposal process needs streamlining. Currently, much tine is used to prepare proposals that will not be funded. Evaluation of preproposals for applicability, relevance, and scientific soundness would help reduce writing and review time. The best research would still be funded. Grants awarded must be larger and funding periods need to be longer to increase efficiency, especially for field-oriented research. Environmental and soil variation often requires many years of data collection to make valid conclusions. Five and even 10-year grants should be realizable.

Accountability in research will be an asset if it is conducted correctly. Focusing on recognized priorities is a big step. Insuring the new technology is rapidly moved toward use is another. Extension and industry have the greatest roles to play in the applied area. Enhanced communication in areas where the private sector is the leader is important. Likewise, involving the private sector in other research will help with communication about the technologies and speed adoption. The federal government has a large role to play in integrating basic and applied research in areas where private industry will eventually take over and when the public well-being requires public funded research.

Closing Remarks

The American Society of Agronomy and the Crop and Soil Science Societies of America thank you, once again, for this opportunity for input into this review process. We hope that we can be of further assistance and look forward to working with this Subcommittee in the future.

TESTIMONY
BEFORE THE U.S. HOUSE OF REPRESENTATIVES COMMITTEE ON AGRICULTURE SUBCOMMITTEE ON RESOURCE CONSERVATION, RESEARCH, AND FORESTRY

Submitted By

Margaret Mellon, Ph.D., J.D.
Union of Concerned Scientists

May 14, 1996

Introduction

Good morning. My name is Margaret Mellon. I am very pleased to be here today representing the Union of Concerned Scientists (UCS), a public interest organization devoted to responsible policies at the interface of technology and society. UCS, which has both scientists and non-scientists among the ranks of its supporters, is interested in practical technologies that can meet human needs without bankrupting the environmental endowment on which future prosperity depends--in a word technologies that are sustainable. In agriculture, UCS advocates the transition to practices that combine high productivity and environmental protection. In the energy field, we advocate the transition to renewable sources of energy like solar, wind, and, of special relevance today, biomass.

Background

In the age of information, the success and shape of American agriculture will depend on the quality of the information and know-how available to American farmers. The question before us is what kind of information and knowledge will our research establishment provide. To answer that question, we need to understand the momentous changes that currently affect American agriculture. American farmers are indeed at the brink of a new era--one that is characterized by increased exposure to market forces, renewed demands for environmental protection, and heightened consumer interest in food quality, safety and methods of production. These trends have been accelerated and reinforced by the passage of the Federal Agricultural Improvement and Reform Act. Farmers operating in the new market will have to anticipate and smooth out the swings in supply and demand characteristic of an unmodulated market. At the same time, agriculture must be conducted with far greater attention to protection of our soil and aquatic resources from pollution and erosion than in the past.

Among the many changes in American agriculture, some of the most important have to do with the diminishing population of farmers. Downsizing in agriculture has been underway for the better part of the century. Starting in 1900, when perhaps 50% of the population was on the land, the downward pressure on farm populations has been relentless. A recent report gives the number of US farms in 1994 as 2 million, down a third from 2.9 million in 1970.[1] Carrying this trajectory into the future has ominous implications for the economy of rural America--but there is at least one bright spot. With a winnowing as severe as this, one can be assured that the survivors are a talented and resourceful lot. And that has important implications for the way research should be conducted and disseminated.

UCS sees the challenge to agricultural research in the 21st century as follows: we need new tools, information and practices that will preserve the productivity gains of the last century while at the same time providing strong protection for the environment and a basis for vigorous rural economies. This is more than we have asked of agricultural research in the past and a tall order by anyone's reckoning. But we are talking about the world's premier agricultural research establishment. We think we have a right to expect a great deal.

Meeting Multiple Goals

If 21st century agriculture is to meet new and challenging goals, we need to provide American farmers new ways of thinking about farms. We believe that the most potent and flexible approach to agriculture grows out of understanding farms as systems, whose elements can be manipulated to meet various objectives. To get the greatest advantage from these approaches, farmers need to break out of the confines of monoculture and industrialized livestock systems and embrace a new agriculture based on sophisticated systems management. This entails a transformation of a magnitude that cannot occur without a redirected and innovative research base. We endorse the recommendation in the recent report of the President's Council on Sustainable Development, *Sustainable America*, that "[a]gricultural research should be refocussed toward integrated farming systems that jointly address productivity, profitability, improved efficiency, and environmental protection."[2]

Jointly is the key word in the recommendation. Research can no longer have a single focus--like improved efficiency, for example--but must aim for efficiency, profitability *and* environmental protection. Let me give you an example of how this charge might operate in an area like hog production. If researchers were looking for the hog production system that best *jointly* addressed "productivity, profitability, improved efficiency, and environmental protection," we doubt that they would come up with the enormous confinement facilities that are beginning to dot the landscape in the Southeast and Midwest. Such facilities may offer efficient production[3] but they do not seem to best *jointly* address productivity and environmental protection. It seems to us that they create huge environmental problems solely as a consequence of their size and the tight concentration of animals.

What if the research community were given the charge of coming up with animal-production systems that met combined environmental and efficiency goals better than the huge confinement systems? Could they do it? We believe they could. But today's research mission is so narrow that researchers rarely have that opportunity. For the most part, scientists end up working on aspects of the hog confinement after the fact--developing waste management techniques or climate-control for stressed pigs. These are worthwhile projects, but they beg the big question--can an animal production system be created/adjusted to avoid most of those environmental problems in the first place and still make money? This is the important question that society wants answered and the one that a research establishment aimed at multiple goals could help answer.

Agricultural Diversity and Systems Management: Keys to the Future

If we take the charge of multiple goals seriously and believe that systems approaches best equip our farmers to meet them, we need new modes of research to make systems approaches practical for farmers. We see opportunities on two fronts: first, increased agricultural diversity and second, increased skills to manage farms as systems. By agricultural diversity, we mean more breeds and varieties of livestock and crops; new plants used as foods; and new non-food uses for crops and trees, including biomass. Let me briefly discuss three ways increased diversity could benefit farmers in today's environment.

First, increased agricultural diversity will help farmers newly vulnerable to market forces to spread and manage the risks of the inevitable rollercoaster of prices on the global commodity markets. Without the cushion of commodity support programs, farmers will have to provision themselves against the inevitable day when prices crash. As in financial investing, the best insurance against risk is a diverse portfolio. In the case of a farm, that means growing more than one or two crops and integrating plants and animals into the operation.

Second, at the same time diverse systems allow for economic risk management, more crops and cultural management options offer new ways to control weeds and insects and improve soil quality. For example, one of the most powerful pest control options available is crop rotation--breaking the life cycle of pest organisms and preventing the build up of pest organisms in the environment. The environmental advantages of crop rotation over purchased chemical inputs used over decades are impressive: fewer poisons on the land, soils teeming with life, surface and ground water less burdened with the accumulations of toxic chemicals and safer food. Rotations can also save the cost of increasingly expensive herbicides and insecticides and increase on-farm profits.

Third, more kinds of crops and livestock could enable some farmers to reintegrate the two activities on the same farm. Integrated crop and livestock operations can recycle animal waste as fertilizer, reduce expenses for fertilizers, and minimize the environmental impacts of animal waste disposal. Livestock/crop operations with a mix of crops offer numerous opportunities to reduce inputs, cut costs and reduce pollution.

Unfortunately, the US inventory of economically attractive crops and livestock is limited. This situation is a result of our enthusiasm for monoculture and the structure of our research and commodity programs, which tend to focus on a very few crops. Now that we are moving away from support programs, we need to identify and develop a vastly expanded set of crops, vegetables, livestock and trees. A good place to start is with abandoned varieties of common crops like corn, potato and squash. But scientists can also look to new foods, like amaranth, and new non-food crops, like kenaf.

Also, diverse farming operations demand different management skills than ones based on monoculture. Rather than a broad knowledge of pesticides and when to use them, for example, farmers need in depth information about soils, cover crops and pests. Moreover, they need to know how the elements interact and how to manage the whole system to make profits and protect the environment.

Our research system is weak in the areas supporting the development of such skills. In many areas, agricultural research has tended to focus narrowly on issues like yield and inputs, often favoring approaches that overwhelm natural systems rather than working with them. Use of pesticides, for example, can make it is unnecessary to understand pest population dynamics in the short term. Using rotation and healthy soil, among other approaches, to manage pests requires a new base of information. Optimizing systems for multiple goals is an even greater challenge than getting them to work in the first place.

We believe that new kinds of research answering new kinds of questions are required if farmers are to have the tools to understand and operate farms as systems. As discussed below, some of the needed research is basic; some is applied.

Strengthen Basic Research in Areas That Support Systems Approaches

In terms of *basic* research, we need to pay much more attention to traditionally underfunded areas like agroecology, population genetics, soil ecology and quality, plant and animal breeding, ecosystems, and watersheds, animal health and behavior. These areas of basic research are fundamental for a systems-based agriculture and sorely needed to complement the molecular level genetic research sc in vogue today. A Cornell University plant breeder and recipient of the 1994 World Seed Prize, Dr. Henry Munger, in a recent interview with *Biotech Reporter*, lamented the effect of agricultural biotechnology in diverting funding and students from conventional plant breeding and called for a more appropriate blend of support for biotechnology and traditional methods.[4] The decline of traditional breeding is well documented. A 1991 analysis of state research support for agricultural biotechnology at land grant universities from 1982 to 1988, for example, showed a substantial increase in the funds, faculty, and students dedicated to biotechnology and a concomitant decline in the numbers of plant and animal breeders.[5]

UCS has found instances where genetic research has led to expensive products that solve problems that would have been better addressed at the systems level. For example, the new genetically engineered insect-resistant Bt-crops often deal with insect pests exacerbated by planting the same crop year after year after year.[6] We believe that crop rotation, improved soil quality and encouragement of beneficial insects represent a better long-term approach to pest control than engineering toxins into crops. That is especially the case as the toxin-containing crops pose high risks of eliciting resistance and losing the pesticidal effect in a very short period of time.[7] Crop rotations and other cultural methods, by contrast, are effective indefinitely.

The USDA supports a number of in house and extramural programs, including the Agricultural Research Service, National Research Initiative, and other research programs of the Cooperative State Research, Education, and Extension Service, whose mix of research topics could be adjusted to amplify the effort in areas like those mentioned above.

Expand SARE

In addition to a more balanced *basic* research agenda, we need more *applied* research on system-based approaches. We are fortunate to have in place a program that is at the cutting edge of applied research--the Sustainable Agriculture Research and Education program or SARE. Three features of that program deserve special mention. The first is the matter of goals. Unlike most agricultural research, SARE research has multiple goals, including environmental protection, production, profitability, and quality of life. SARE projects, for example, look for ways to manage pests by rotation, cover crops, and other methods that *both* solve environmental problems and increase profits by saving on costly chemicals. SARE does not count as successes projects that meet the environmental goals but would put farmers out of business. The program aims only for approaches that truly meet *all* the goals.

Second, SARE has an explicit mission to support interdisciplinary whole farm research. The farm is the fundamental unit of management for farmers seeking to meet multiple goals and should be a natural focus of research. But sensible as it sounds, whole farm research faces substantial obstacles. These arise, at least in part, because whole farm research is interdisciplinary and long term. In both respects, the research run counters to the routines of academe, which is organized into disciplines and rewards relatively short-term projects. Individual investigators interested in such projects are plentiful, but Departmental leadership is required to provide context and resources within which such research can be done. But SARE is doing it. For example, SARE sponsored a four-year project examining ways to improve the sustainability of dryland farming systems common to six Northwestern states. Led by a Washington State University researcher, the multidisciplinary project involved scientists in agronomy, soils, plant pathology, and agricultural engineering from five states and twenty-eight farmer cooperators from the region. The farm-system research has the potential to help dryland farmers in the Northwest reduce overfertilization, pesticide use, and soil erosion while improving farm profitability.

Third, SARE is operated in novel and effective way--via regional councils made up of a mix of farmers, scientists, government officials and private sector representatives. It is especially important that research projects are developed and evaluated in close collaboration with farmers. As I mentioned above, the farmers that have survived the great agricultural exodus are generally smart and savvy. The effective research programs of the future will regard them as potential partners rather than just customers. Collaboration with farmers ensures that scarce funds are directed to the problems in the greatest need of attention. In addition, two-way communication allows researchers to avail themselves of the expertise that farmers possess. Farmers in the sustainable agriculture community, in particular, have pioneered many systems-based approaches.

SARE is an innovative and effective program that deserves a higher level of support than it currently receives. With greater support, for example, it could expand more vigorously into areas like marketing and value-added products that would equip farmers to capture a greater share of food and fiber dollars. Programs like SARE will be increasingly important as more and more farmers bear the brunt of the cold winds in the market place.

Set Aside Resources for Biotechnology Risk Research

We are at the brink of the commercialization of a new generation of crops and animals modified by the techniques of genetic engineering. These techniques allow scientists to modify the genetic make-up of organisms without regard to biological boundaries. The results of such engineering are so-called "transgenic" organisms with combinations of genes from unrelated organisms, often from sources in different kingdoms. Research is currently underway to produce transgenic crops, trees, insects, nematodes, fish and microorganisms. If these projects pan out commercially, such organisms will be used in large numbers in the environment where control is difficult, if not impossible. Releases of organisms with new combinations of genes and new traits have long raised concerns about the untoward and unwanted effects on the environment and/or human health.[8] Recent articles in *Nature*[9] and the *New England Journal of Medicine*[10] (available upon request) confirm that the risks are not fanciful, but real.

UCS recommends that the USDA continue to dedicate, as it does now, at least a small part of its research resources to projects seeking to understand and assess the risks associated with engineered organisms. The current program has produced a substantial body of research illuminating the potential for engineered organisms to transfer genes into wild populations, produce new weeds, and create new viruses. Such research pays dividends in a number of ways. First, it allows the prediction and control of the risks of employing biotechnology. Second, it helps prevent the public relations disaster that would result from unexpected harm caused by products of the new technology. Third, in some instances the research will strengthen our position in trade disputes. Such dispute will be resolved by the World Trade Organization which insists on scientific justifications for restricting trade. In such disputes, the lack of scientific foundation on risk issues could leave the US unnecessarily vulnerable.

We urge that consideration be given to setting aside 5% of the money devoted to development of biotechnology for research into the characterization and assessment of risk. In any case, the percent set-aside should not fall below the current 1%.

Increase Research on Power Crops

UCS has been long been concerned by our excessive dependence on fossil fuels for energy. Combustion of coal and oil is a major contributor to air and water pollution and global warming. One way to reduce some of the problems associated with fossil fuels is to substitute biomass in the form of fast-growing trees and crops.

Biomass, renewable organic matter which can be converted to energy, includes agricultural crops and residues, commercial wood and logging residues, animal wastes, and the organic part of municipal solid waste. These raw materials, or feedstocks, are converted to biomass resources, which may be solid, liquid, or gas. In turn, the biomass resources can be used to generate electricity, transportation fuels, and chemical products. Electricity from biomass is particularly important now because power crops can provide farmers with additional high-value cash crops at the same time that changes in federal agricultural policy allow crop diversification. The use of biomass for energy production offers great potential for producing thousands of jobs, mainly in the agricultural sector and for generating up to two-thirds of the country's electricity needs at the same time that it significantly reduces carbon and sulfur dioxide emissions.

Currently, poplar, sugarcane, alfalfa, switchgrass, willow, sorghum, kenaf, and rice are among the crops under consideration as potentially commercially viable biomass sources. We recommend increasing research efforts identifying and developing diverse crops for use as power crops.

Develop Information Exchanges with Developing Countries

One of the looming challenges of the 21st century is the need to feed the expanding populations of the developing world. In the cases where population pressure and changing diets result in more paying customers for US agricultural products, this is good news for American agriculture. Global demand and prices should rise. But much of the growth in the human population, and hence the new demand for food, will come from people who cannot pay, and many of these could go hungry or undernourished.

It is appropriate that the United States research establishment begin to look at what role it might play in meeting the growing food requirements of the 21st century. Simply increasing US production is not the answer. We are all aware of the complexities of trade that can make increased production here counterproductive in terms of feeding hungry people elsewhere. We need more sophisticated approaches that will build the indigenous agricultural capacity in developing countries. But we must learn the lessons of the Green Revolution: increased food production at the expense of an even faster pace of environmental destruction will not suffice. In many countries, the environmental losses are so great they already retard economic development. What we need are agricultural methods that are more productive without ravaging the environment.

While the issue deserves much more consideration than we have time for here, we suggest that there are two ways the US agricultural establishment could help. The first is to get our own house in order--to transform our own agricultural system into one that is genuinely sustainable. With our rich natural, institutional and intellectual resources, we should be able to develop a highly productive agriculture that does not lose soil, pollute water, or contaminate food. Our society does not face the specter of producing more people than we can feed. That gives us the luxury of solving agriculture resources issues and serving as model for the rest of the world. We could become a leader in developing and implementing new technologies and policies appropriate for us that balance food production and environmental and social concerns.

Second, we should devote resources to programs that exchange information with agricultural scientists and farmers in developing countries. Although the US has great expertise in certain aspects of high production agriculture that we could share, the exchange would not be a one-way street. We have much to gain from others. Our narrow genetic base and industrialized methods leave us unnecessarily vulnerable to pests, for example. Developing countries, by contrast, are vast repositories of agricultural biological diversity, including the wild relatives of crop plants, which are treasure houses for plant breeders. In addition, farmers and scientists often have experience with wide ranges of cultivars and methods of growing food that take advantage of and are compatible with nature. Exchange of information could help us identify wild plants that could be used as new foods, develop innovative methods of pest control, and protect the valuable wild relatives of our crops. It could be fruitful on both ends.

Summary

In summary, UCS wholeheartedly supports the need for continued generous support of agricultural research as essential to the advance of US agriculture. We commend to this committee a new vision of agriculture based on diversity in crops and livestock and a new sophisticated approach to systems management. We recommend that the USDA research agenda reflect a solid commitment to *basic and applied* research that would support systems management, whole farm planning, and the development of new crops and livestock breeds. Among the many possible new uses of crops, we especially favor the sustainable development of grasses and trees as a renewable source of energy. Finally, we recommend SARE as a model program for applied agricultural research in the next century.

Endnotes:

1. The President's Council on Sustainable Development, *Sustainable America: A New Consensus for Prosperity, Opportunity, and a Healthy Environment for the Future*, US Government Printing Office, Washington, D.C., February 1996.

2. *Id.*, 127.

3. Large corporate livestock facilities are not necessarily highly efficient. For example, a June 1995 report by the Center for Rural Affairs (Walthill, Neb.), "Spotlight on Pork II: Corporate Farming Update," cites Kansas and Nebraska hog-farming data highlighting the greater efficiency of many smaller hog operations compared with larger facilities.

4. K. Wrage, "A lost generation of plant researchers," *Biotech Reporter* 12(7): 1, 4, July 1995.

5. C. Hess, "Resource allocation to state agbiotech research: 1982-1988," *Bio/Technology* 9: 29-31, January 1991.

6. Bt cotton, for example, is targeted at insect pests--the cotton and pink bollworms and tobacco budworm--which build up as a result of continuous cotton cultivation and which could be suppressed through crop rotations (K. El-Zik, *et al.*, "Cultural management and pest suppression," Chapter 2 in R. Frisbie, *et al.*, eds., *Integrated Pest Management Systems and Cotton Production*, John Wiley & Sons, New York, 1989).

7. F. Gould *et al.*, "Selection and genetic analysis of a *Heliothis virescens* (Lepidoptera: Noctuidae) strain with high levels of resistance to *Bacillus thuringiensis* toxins," *Journal of Economic Entomology* 88: 1545-59, 1995.

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PRESENTED BY

PROFESSOR WILLIAM F. THOMPSON

Thank you, Mr. Chairman. I appreciate the opportunity to appear before you today to discuss the role of peer reviewed basic science in our country's agricultural enterprise. I am here on behalf of the American Society of Plant Physiologists, an organization representing over 5,000 plant scientists working in academia, government, and industry. I am a faculty member at North Carolina State University, where I hold the title of University Research Professor of Botany, Genetics, and Crop Science.

I have extensive personal experience with peer review from the applicants' perspective. In addition, I have several times served as a member of grant review panels for the National Institutes of Health and for the National Research Initiative Competitive Research Grants Program (NRI) at USDA. I have also served as Manager of an NRI panel on Plant Genetic Mechanisms, and I am presently serving as Associate Editor of a peer-reviewed journal, Plant Molecular Biology.

Throughout my scientific career, which now covers more than 25 years, I have been engaged in basic science, or what is often called "pre-technology research." That means I am concerned primarily with the input end of the technology pipeline. ASPP has observed that this end - the basic research end - of the pipeline has received far too little attention in recent years, and I will include a few words about this at the end of my testimony. However, I will begin by addressing the issue of peer review. ASPP believes, and I believe, that a well-managed peer review system is fundamental to a healthy basic research enterprise.

PEER REVIEW

The essence of peer review is that research proposals and research progress must be evaluated by practicing scientists with relevant expertise. I suggest it is the only widely applicable and effective means of choosing which projects to support in pre-technology research as well as many technological and applied research areas.

However, peer review is much more than just a means of selecting high quality proposals and publications. It also functions to upgrade the quality of science generally. I know my own science has been much improved by having been repeatedly subject to peer review, and I think this experience is nearly universal. This view is supported by the National Academy's Board on Agriculture, whose 1994 report (1) on the NRI pointed out that peer reviewed science:

Is responsive and flexible, putting a premium on new initiatives and ideas. Competitive peer review forces applicants for funding to design experiments at the cutting edge of their discipline. In addition, because new proposals are being considered from all sources each year, and because the same programs do not have to be continued indefinitely, the system can respond quickly to rapid changes in scientific knowledge.

Attracts participation from a broad range of scientists. Scientists from many different private, state, and federal agencies compete for funding. The mixture creates a 'leavening' effect, facilitating rapid dispersal of new insights and perspectives between communities that might not otherwise interact.

In addition, I think it is important to make the point that a good peer review system is not an "old boy network" as some have claimed. Indeed, it is anything but that, and is in fact specifically designed to defend against cronyism and undue influence of special interests. I will illustrate this point from my experience as Manager of an NRI review panel. I have three main points to make.

First, both panel members and managers are selected for their expertise and as representatives of the scientific community. Thus our review panels include a wide range of viewpoints. Membership changes frequently to assure widespread participation and avoid intellectual entrenchment. Panel members serve terms of no more than three years, while a manager's term is one year.

Secondly, extensive precautions are taken to avoid conflicts of interest, both financial and intellectual. Both panel members and outside reviewers must declare any potential conflicts. In particular, they are not allowed to participate in the review of proposals by anyone with whom they have recently had a research collaboration, or proposals submitted by other employees of their home institution.

Thirdly, proposals are evaluated by a process of panel discussion, in which typically 15-20 experts in relevant subdisciplines are assembled in a room. Each proposal is reviewed by at least two panel members, and the panel also receives opinions from outside experts. Priority ranking is by group consensus, and cannot be altered by the Panel Manager or USDA staff. The use of multiple, independent evaluations, and the fact that each evaluation must itself be judged by the panel in open discussion, makes it quite difficult to obtain funding for a poorly conceived proposal or a non-productive investigator.

PRE-TECHNOLOGY RESEARCH

In recent years we have seen striking increases in the quality of research, and research proposals, in agricultural biotechnology. Several factors are responsible for this increase, one of which is the creation several years ago of a peer reviewed competitive grants program in the USDA. Significantly, however, the increase in quality has not been accompanied by a proportionate increase in funding for peer-reviewed programs, and review panels are increasingly confronted with the near-impossible task of choosing among equally excellent proposals on different, but equally important, topics. This problem brings me back to the need to open up the input end of the knowledge pipeline.

I think of pre-technology research as providing intellectual capital for subsequent technological innovation and product development. This intellectual capital takes the form of new knowledge pertaining to fundamental questions about how plants and animals work - questions such as

How are genes turned on and off, for example to regulate growth, induce flowering, or resist pathogen attack?

How do cells control the formation of structures such as chloroplasts, which are the seats of photosynthesis and biochemical factories for many cellular constituents?

How are many thousands of chemical reactions and physiological processes controlled and integrated to produce a functional organism?

How do individual organisms interact in a crop ecosystem or the natural environment? How do past and future agricultural practices influence these interactions?

In pre-technology research it is usually not possible to predict specific applications for specific research projects. However, downstream applications can be many and varied, and the initial investment is often returned with compound interest. This "value-added downstream processing" is probably the reason a 1995 report from Economic Research Service (2) found twice as high a rate of return per dollar invested for basic research compared to other types of agricultural research (which already have quite a high rate of return). Obvious as it may seem, it is also worth noting that you can't add value to something that doesn't exist. Thus the rate of progress in the entire agricultural research enterprise is restricted when pre-technology research fails to keep enough intellectual capital in the pipeline.

The societal value of pre-technology research is usually maximal when its results are in the public domain, available to anyone with the knowledge and ability to exploit basic research discoveries. That means its results shouldn't be proprietary, and thus that pre-technology research activities should be supported mainly by public funds in order to maximize their economic and social benefits.

LIMITATIONS AND OPPORTUNITIES

We are in the midst of a biological revolution that may well surpass the revolution in electronics in its impact on the human condition. You read about new advances almost every day, usually in connection with human health. The biological revolution is no less dramatic in agriculture. Progress has come more slowly than predicted in the initial excitement over new technology. However it is coming. In Canada, the estimate is that by the year 2000 sales of agbiotech products produced in Saskatchewan alone will exceed $200 million (3). In the U.S., some of my industrial colleagues are estimating we will have up to 6 million acres of transgenic crops this year, and that plant biotechnology sales could reach $2 billion by 2001 and rise to $6-7 billion by 2005 (4).

One of the main reasons the agricultural biotechnology has taken longer than expected to become profitable is that when recombinant DNA and biotechnology came along in the early 1980s, we simply did not have the fundamental knowledge base that would have been needed to support rapid technological innovation. That knowledge base has been increasing, but not nearly fast enough to support the kind of innovation that might otherwise be possible. I think the reason is very simple. We have not invested in enough high quality, peer-reviewed, pre-technology agricultural research.

Most of our national investment in peer-review basic biology has gone to research relevant to medicine and human disease. Of the investment we have made in agricultural research, the vast majority has supported technology and application rather than the pre-technology basic science that creates new intellectual capital. There is considerable support for technology and application research even within the NRI. All of it is good quality and should be supported. Indeed, we should support much more research of this type on a competitive basis. However, the most urgent need for expansion is in the pre-technology area.

These concerns apply not only internally, to our own agricultural economy, but externally, to our ability to maintain a competitive position in an increasingly competitive global economy. Many countries, notably Europe, Australia, and Japan, have active programs of basic as well as applied research in plant biology and agriculture. Leadership roles in these disciplines are increasingly shifting overseas. It seems unlikely that we can maintain a favorable competitive position much longer without increasing the rate at which we develop our own intellectual capital.

SUMMARY

I think the potential exists to improve the competitive position of US agriculture by opening up the intake end of the technology pipeline. To accomplish this goal, I think we need to invest more in peer-reviewed pre-technology research in order to increase the rate at which we create non-proprietary intellectual capital that fuels our applied research programs and underpins proprietary research and development in the private sector.

It is appropriate to include various stakeholders in the process of setting overall goals for this enhanced research enterprise. However, support for individual research projects should be awarded using established procedures for peer review to assure scientific excellence while encouraging participation by a wide variety of top quality scientists and research institutions.

Thank you very much for your attention.

REFERENCES

(1) Board on Agriculture, National Research Council. "Investing in the National Research Initiative. An Update of the Competitive Grants Program of the U.S. Department of Agriculture". National Academy Press, Washington, D.C., 1994.

(2) USDA Economic Research Service. "The Value and Role of Public Investment in Agricultural Research". Staff Paper Number 9510, May, 1995. [Core ranges for estimates of social rate of return are given as 40-60% for all publicly funded agricultural research and developement and 60-90% for publicly funded basic agricultural research.]

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(3) Kidd, G. "Agbiotech goes Canadian." Biotechnology 13, 1157, 1995

(4) Projections from Monsanto Co., St. Louis, MO, quoted in a letter dated 7 May 1996 from Keith Fuglie, Economic Research Service, to Arthur Kelman, NCSU

Mr. Chairman and members of the subcommittee. My name is Peter Barry, Professor of Agricultural Finance at the University of Illinois and a past president of the American Agricultural Economics Association. I testify today with David L. Brown, Professor of Rural Sociology and Chair of the Department of Rural Sociology at Cornell University. We testify on behalf of the Consortium of Social Science Associations (COSSA), an advocacy organization representing close to 100 professional associations, scientific societies, educational and research institutions (including the Rural Sociological Society and the American Agricultural Economics Association). COSSA is concerned with the promotion and federal funding of important research by social, economic, and behavioral scientists. A list of COSSA Members, Affiliates, and Contributors is attached to the testimony.

SOCIAL SCIENCE IN THE AGRICULTURAL RESEARCH SYSTEM

Within the agricultural research system, "social science" includes the subdisciplines of agricultural economics, rural sociology, agricultural education, agricultural communications, family and consumer economics, and human development and family studies. These disciplines seek to better understand the factors affecting the economic performance of agriculture, the well-being of rural people, and the viability of rural communities. They are also concerned with the sustainability of farm and rural businesses, the preservation of rural environments, and the protection of natural resources. Social scientists have much to offer in helping to articulate social, economic, and environmental objectives; designing approaches to research prioritization and program evaluation; analyzing policy alternatives; and communicating the results of scientific investigations to policy makers, stakeholder groups, and the general public.

TESTIMONY OBJECTIVES

We will present our views about new initiatives and key revisions in the Research Title of the Farm Bill, funding mechanisms for agricultural research, research prioritization and evaluation, and the need for further progress in interdisciplinary work. In particular, we urge:

1. Renaming the NRI Markets, Trades, and Rural Development Program to Economic and Social Systems.
2. Greater emphasis on interdisciplinary research.
3. Support for Policy Research and Education Centers at land grant universities.
4. Balanced research funding, including continuation of formula funds, special grants, and competitive grants.
5. Leadership by social scientists in research planning and performance measurement.

CHANGING THE NAME OF THE SOCIAL SCIENCE PROGRAM OF THE NATIONAL RESEARCH COMPETITIVE GRANTS PROGRAM (NRI) FROM MARKETS, TRADE, AND RURAL DEVELOPMENT TO ECONOMIC AND SOCIAL SYSTEMS

When the NRI was established and began operations in 1992, the primary social science component was identified by statute as Markets, Trade, and Policy. This title was intended to " encompass all of the issues that related to the economic and societal implications, effects, consequences, profitability, and value of the agricultural, food, and environmental system in their national and international dimensions" (page 79, Investing in Research: A Proposal to Strengthen the Agricultural, Food, and Environmental System, Board on Agriculture, National Research Council, Washington, DC, 1989). However, the program area has operated with a much narrower orientation. This name was soon changed to Markets, Trade, and Rural Development in order to accommodate research on rural

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communities and socio-economic development. The program now operates with two sub-programs: 1) Markets and Trade, and 2) Rural Development. From 1992 through 1995, the Markets and Trade sub-program awarded 79 grants out of 351 proposals submitted (a 23% success rate) for a total of $6.955 million or $88,043 per grant. Comparable figures for the rural development program are 50 grants out of 275 submissions (an 18% success rate) for a total of $6.813 million or $136,263 per grant.

Within the Markets and Trade component, 63 of the 79 grants focused explicitly on international trade, foreign markets, and global competitiveness, while the other 16 addressed a variety of selected topics. Clearly, this strong international concentration of research support has resulted in important, new information on foreign markets and trade. However, numerous other social and economic issues warrant inclusion in the NRI agenda. Examples include the continued industrialization of agriculture and its implications for farm, resource, credit, and development policies; the impacts of development on and from the natural environment; more cost effective risk management in agriculture and other predominantly rural industries; improvements in electronic and technology-based information systems for agriculture and rural communities; the impacts of changes in social welfare policies on the economic security of rural persons and families; consumer behavior and understanding of food safety; the economics of environmental and resource management; and the agricultural economic impacts of global climate change.

Moreover, the major priority areas for research and education stated in the 1996 Farm Bill indicate the growing emphasis and value placed on economic and people issues in agricultural research. These priority areas include economically viable production systems; global competitiveness; improved quality of life for individuals, families, and communities; an affordable, safe, reliable, and nutritious food supply; effective risk management; and further development of human capital in the agricultural sciences.

Changing the name of this NRI program from Markets, Trade and Rural Development to Economic and Social Systems will result in important new knowledge on this broader agenda of rural and agricultural concerns. It will result in a targeting of effort toward a broad range of critical social and economic issues of interest to agriculture, consumers, and rural communities. It will also provide a parallel to the other NRI programs focusing on Animal Systems, Plant Systems, and Agricultural Systems.

COSSA urges a broadening of the title for this important NRI program.

IMPROVING THE OPPORTUNITIES FOR INTERDISCIPLINARY RESEARCH

As discussed above, many of the research programs are organized along disciplinary lines (e.g., economics, animal science, plant science, natural resources, etc.). A disciplinary focus is logical to expect because scientists are educated and work significantly with peers in specific knowledge areas. However, relying solely on a disciplinary delineation of research program areas is detrimental because many of the important problems and issues of the day are interdisciplinary, calling for research teams comprised of diverse scientists who are motivated to work and communicate together. Segregating the disciplines in this way has the effect of discouraging, or at least not actively encouraging research proposals that address the human behavior or institutional aspects of economic and social problems relating to the natural, biological, and physical sciences. This is a problem because the direct and immediate, or eventual and potential contributions of publicly funded agricultural research to the resolution of social concerns is the very basis of public research support. (K.R. Smith, "Perspectives on the NRI and the Social Sciences" Professional Societies Forum, Board on Agriculture Natural Research Council, October 1994).

Interdisciplinary research is on the increase and numerous success stories can be cited, but much more needs to be done to encourage and facilitate joint work. Such collaboration should involve the various social, behavioral and economic sciences, and it should integrate social sciences with their counterparts in biology and the physical sciences as well. Such interdisciplinary collaboration is not occurring on a regular basis within the NRI even though it is encouraged in the program description.

Besides the Markets, Trade, and Rural Development Program, the other five program areas of the NRI do contain language in their descriptions about socio-economic implications, but the integration of social science work into these other areas has been slow to develop. The relatively new Agricultural Systems Program, funded by assessments from the other NRI program areas, is a significant step in the interdisciplinary direction. And, the water quality and value-added programs experienced good progress in social science involvement for the 1996-97 NRI grants. However, more support, incentive, and direction are needed to further stimulate interdisciplinary collaboration in planning, proposal evaluation, implementation, and assessment of agricultural research.

COSSA urges greater emphasis on interdisciplinary work involving the social, biological, and physical sciences.

AUTHORIZING THE CREATION OF POLICY RESEARCH CENTERS

COSSA supports and endorses the authorization in the 1996 Farm Bill of a limited number of Policy Research and Education Centers at land grant universities to permit quick turnaround, policy-focused social science analysis of pressing issues. Policy makers need reliable, objective, and timely analyses of policy options before they become law. Policy research centers can serve as centers of excellence and mobilize the skills, experience, and analytical models of university social scientists to get the job done.

Such policy centers can be established on a competitive basis under multi-year arrangements with one or more universities under the stipulation that the lead institutions will partner with on-going policy work at peer institutions, perhaps on a competitive grant or contract basis. Examples of the policy focus of these centers could include the effects of public policies on: 1) the farm and agricultural sectors; 2) the environment; 3) rural families, households, and economies; and 4) consumers, food, and nutrition.

SOCIAL SCIENCE CONTRIBUTIONS

Recently, Dr. Joe Coffey, employed with Southern States Cooperative in Richmond, Virginia and Chair of the Council on Agricultural Research, Extension, and Teaching (CARET), outlined the following strengths of social scientists in research and education:

- Utilize a systems approach, providing a broad base for analytical work.
- Concerned about people and places, and the related human capital and social behavior.
- Exhibit a market sensitivity and savvy.

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- Focus on goal-driven allocation of scarce resources.
- Have expertise in business, finance, organizational economics, and institutions.
- Exercise a policy perspective in evaluating alternatives and impacts.
- Understand institutional missions and performance.
- Understand externalities, associated with food safety, the environment, public versus private goods, and other related issues.

These strengths correlate closely with the goals and priority areas of the U.S. agricultural research system, outlined earlier. Indeed, all research--including that of the biological and physical sciences--has improvements in societal well-being as the ultimate goal.

Given these attributes and goals, why should the U.S. support social science investigations as part of its investment in agricultural research? What public value is created by the social sciences? Social science provides research-based information that contributes to improved public and private decision making. More specifically, social science research contributes basic knowledge on the structure and performance of the nation's social and economic institutions, and on the alternative futures implied by social, economic, technological, and public policy changes. More pragmatically, social science research provides most of the conceptual and methodological tools for measuring accountability of public expenditures (including those on public research itself). And, social science contributes to the design of public programs to ameliorate social and economic problems and to the geographic and socio-economic targeting of public assistance. These contributions are reflected in the USDA-CSREES programs including the NRI, formula funds, special research grants, and the Economic Research Service of USDA.

FUNDING MECHANISMS

In terms of federal funding sources, research expenditure data at the federal level indicate that social scientists in recent years receive about 4.2% of the competitive grant funds allocated under the NRI, about 8% of the formula (HATCH) funds, and about 12% of special research grants earmarked by Congress. The higher percentage received from congressionally mandated special grants reflects the growing priority of social and economic issues concerning agriculture and rural America. Targeting support through special grants has been a quicker way to meet emerging research goals and priorities than trying to reallocate NRI and formula funds. Special grants also offset a tendency for concentration of competitive grants in a relatively small number of states. A 1995 ERS report indicates that a larger share of special grants went to states that receive a much smaller share of competitive grants ("Agricultural Research and Development" ERS/USDA no. 9517, August 1995). If special grants are to be reduced, new mechanisms would be needed to ensure timely flexibility in funding allocations for new and emerging research goals.

The increment to research funding under the new Fund for Rural America is a welcome addition to the research support base. Careful synthesis of this support into the overall agricultural research portfolio is needed in order augment the breadth of the federal/state partnership in research and education for rural America. How the new program complements or otherwise relates to the NRI competitive grants program must also be considered.

COSSA recommends that Congress maintain its strong support for a balanced portfolio of research funding that includes formula funds, special grants, and competitive grants.

ACCOUNTABILITY AND SOCIAL SCIENCE RESEARCH

Social Science also helps to clarify and measure the "so what" of science. How is society better off for allocating money to public programs? Social sciences provide many of the tools to determine whether public investments are worthwhile. The recent "Agricultural Research Assessment Symposium" conducted by the Council on Food, Agricultural, and Resource Economics (C-FARE) concluded that while "rate of return" type economic analyses still comprise the core of accountability research, society now expects broader information about the social and environmental impacts of public investments. Social scientists are well positioned to provide this information.

The Government Performance and Results Act provides a mandate for a structured process of strategic planning, prioritization, and program evaluation. A process is a necessary, but not a sufficient condition. Effective implementation and workable measurements are needed as well. As the GPRA mandate is addressed by CSREES, COSSA urges that social science expertise be utilized throughout the process in delineating goals, determining priorities, designing research programs, and conducting ex-ante and ex-post research assessments. Clear guidelines and effective measures are needed at the federal level and for state agricultural experiment stations to enhance the federal/state partnership in agricultural research and meet their public purpose.

IN CLOSING

Thank you for the opportunity to testify before your committee about these important issues affecting the agricultural research system. I would be happy to answer any questions.

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INTRODUCTION

Insect resistant crop varieties are those varieties that yield better than susceptible varieties when both are attacked by a pest insect. In the broadest sense, plant resistance to pests is defined as the consequence of heritable plant qualities that result in a plant being relatively less damaged than a plant without the qualities. In practical agricultural terms, a pest-resistant crop variety is one that when confronted with pest invasion, produces a better yield than a susceptible variety. Resistant varieties are created by identifying genetic sources of resistance and transferring resistance traits to agronomically acceptable (e.g. high yielding) varieties either by sexual crosses or, less commonly, by plant genetic engineering techniques. Progeny are then assessed for desirable levels of resistance and agronomic qualities. When a variety has been bred to yield as much as the original susceptible variety, the new variety is released for agricultural production.

Many crop varieties have been developed with resistance to insect pests controlled by chemical or morphological factors inherited from a pest-resistant donor parent. In cases where a few genes control resistance and the variety is grown on large areas of farmland, insects have adapted by expressing genes that overcome the effects of crop plant resistance. These counter adaptations, often called biotypes, have, in turn, led plant breeders to consider different resistance gene deployment strategies. Some of these deployment strategies involve releasing single major genes over time, releasing several minor genes simultaneously, mixing varieties that contain different major genes, or deploying different genes in different geographic regions.

HISTORICAL SUCCESSES

The use of pest-resistant plants has been recognized for many years as an economically and environmentally sound approach to crop protection in the United States. Two of the earliest uses of resistant varieties against insect pests were resistant wheat varieties used to manage Hessian fly in New York in 1788, and the use, at the turn of the century, of apple varieties resistant to the woolly apple aphid. Probably the most famous example of the successful use of insect-resistant plants was that of American grape rootstocks that saved the $2 billion French wine industry from the ravages of the grape phylloxera, a plant louse, in the late 1800s.

The "miracle" rice varieties with resistance to insect pests that changed several Asian countries from rice-importing to rice-exporting countries is a modern-day example of the success of insect resistant varieties. **Today, more than 100 varieties of insect-resistant alfalfa, corn, sorghum, and wheat are grown in the United States, and twice this many insect- resistant varieties are grown in Africa, Asia, and Europe.** However, these successes in the use of pest-resistant crop varieties impact less than one percent of the total number of pest species for which pest-resistant varieites need to be developed.

ECONOMIC BENEFITS

The economic benefits that result from the use of pest-resistant varieties in production agriculture are tremendous. Plant resistance research provides a substantially greater return for each dollar invested in development, compared with research to develop chemical pesticides. The review of several examples of insect-resistance is illustrative of the economic benefits and are representative of the benefits that can accrue with the deployment of resistance to other pathogens as well. **During the late 1960s, several wheat varieties resistant to the Hessian fly were developed that resulted in a return of approximately $600**

on each dollar invested in research, compared to a $5 return on each dollar spent on the development of insecticides during the same period, a 120-fold greater return on the investment. In the same time period, costs for developing of varieties resistant to several insect pests of wheat, alfalfa, and corn totaled about $9.3 million and resulted in total savings to producers using these varieties of about $308 million annually, or a 300:1 return in 10 years on each research dollar invested.

Based on reduced insect damage and reductions in the costs of insecticide applications during the same period, the value of insect-resistant varieties of alfalfa, corn, barley, and wheat was almost $500 million each year. Sorghum varieties with resistance to the greenbug aphid and the chinch bug greatly decreased insecticide use and production costs. The use of greenbug-resistant sorghum has reduced insecticide use by as much as $50 million during some years. Resistance to the wheat curl mite reduced the incidence of the wheat streak mosaic virus disease by an average of 76% from 1979 to 1988 in Kansas alone and increased producer profits by about $135 million. That resistant corn inbreds grown in the midwestern United States reduced losses by the European corn borer from $350 million in 1949 to $10 million in the 1960s.

Using modest (4%) increases for inflation, the combined effect of **the production of insect-and mite-resistant alfalfa, barley, corn, sorghum, and wheat varieties in the United States alone is currently more than $1.4 billion each year.** Corn, cotton, and potato varieties containing bacterial proteins toxic to insects are beginning to be used on a large-scale basis in the United States (see below). The greatly decreased cost of production of these crops, resulting from insect resistant traits, will nearly double the current annual economic value of insect resistant crops to U. S. agriculture.

ECOLOGICAL AND ENVIRONMENTAL BENEFITS

Economic considerations aside, ecological and environmental benefits also arise from the use of insect resistant varieties due to increases in populations of beneficial insects and microorganisms in the agroecosystem, in part because of reduced use of pesticides. These increases in species diversity increase agroecosystem stability which is far less polluted and less detrimental to natural resources. Environmental advantages also include cleaner water supplies because of reduced pesticide applications. **During the past 20 years, for example, the use of insect-resistant varieties of alfalfa, barley, corn, and sorghum has prevented the application of more than six million tons of insecticides into the croplands of the United States.**

Cotton population is a case point. About one-half of all insecticides used are applied to control insect pests of cotton. Improved varieties with the 'frego' or open bract condition of cotton buds and the 'okra' (thin) leaf trait better expose some insect pests to insecticides and increase efficiency and decrease the amount of insecticide required for control.

New sorghum varieties with moderate resistance to the sorghum midge allow much less insecticide to be used to maintain net crop yield and value. Corn hybrids resistant to the corn earworm, require much less insecticide than do susceptible hybrids to achieve equivalent levels of corn earworm control. In some situations, the amount of insecticide applied can be reduced by as much as 28-fold. Resistance to the southern corn rootworm, in the peanut variety 'NC6' is effective enough that insecticide applications for rootworm control has been reduced by 80%.

significantly reducing total peanut production costs. These examples of the ecological and environmental benefits of the use of pest-resistant varieties are dramatic. However, they do not include the bonus effects of reduced pest infestation in adjacent susceptible crops and the absence of secondary pest outbreaks.

IDENTIFYING RESISTANCE

The development and eventual use of a pest-resistant variety starts with the identification of a genetic source of resistance in a plant. Genes imparting this resistance are then incorporated into existing agronomically acceptable plant varieties, and the ensuing progeny are used to develop new varieties that are at least as agronomically acceptable as those currently being grown. The major steps in developing pest-resistant varieties begin with an interdisciplinary group of entomologists, plant breeders, plant pathologists, and other crop production specialists, reviewing the pest problems of the crop. The nature of plant damage and the biology and ecology of the target pest are then determined. Adapted and wild germplasm is then collected and evaluated for resistance. In the process, methods appropriate to evaluate the germplasm for resistance is developed and the screening program is begun. With harvest of seed of each generation of resistant plants, seed of resistant progeny are saved, grown and those plants crossed back the agronomically desirable parent variety. The permanence and stability of resistance is then determined under diverse cultural and environmental conditions. The effect of resistance traits on key beneficial insects in the cropping system is then determined. The economic value of resistance in elite hybrid lines of germplasm is then determined by comparing damage done to infested versus non-infested plants. Seed of elite resistant germplasm is then multiplied and released to public and commercial organizations. The economic and environmental benefits of the new variety is then publicized to producer groups, using demonstration plots, press releases, and other educational methods.

WHAT MAKES PLANTS RESISTANT?

Both chemical and morphological plant traits convey plant resistance to insects. Lethal effects to pests from these types of resistance may be acute. Exposure to resistant plants over a long period of time can cause mortality to later insect growth stages. Insects surviving the direct effects of these plant defenses may also suffer debilitating effects that reduce body size and weight, prolong development of the immature stages, and reduce reproduction in surviving adults.

Resistance may occur because of the presence of plant odors that repel insects, plant chemicals that deter insect feeding or oviposition, or because key feeding or oviposition stimulants are missing in a resistant plant. Resistant varieties may also lack the proper quantities of basic nutrients needed by pests or may contain naturally produced chemicals toxic to insects.

Some of the more important plant physical characters associated with resistance include: the shape, size, and color of plants; high levels of leaf waxes; dense pubescence; dense trichome masses; spines; overly hard plant tissue; and tissue that exhibit a hypersensitive response to insect feeding damage. Elevated levels of the basic plant structural chemicals, lignin and silica, in plant tissues can reduce insect digestion. Plant surface trichomes and pubescence are the first plant organs contacted by insects, and can restrict their ability to feed, move, or reproduce on the plant. Non-glandular simple or hooked trichomes can impale and kill insects, especially at immature growth stages. Glandular trichomes which secrete an adhesive chemical entrap insects and kill them.

BIOTYPES

Biotypes of insects are individuals or populations of a species that can damage a plant formerly resistant to the pest species. Biotypes and races form in much the same way that insect pests develop resistance to insecticides, by the selection of individuals that can survive the insecticide. This change involves pest variability, genetic selection, mutation, or recombination in the pest population.

The loss of plant resistance caused by genetic changes in the pest is commonly believed to be due to the gene-for-gene selection of virulence genes in the insect that match plant genes for resistance. Generally speaking, the fewer the genes that confer resistance and the more extensively and longer the resistant variety is commercially grown, the more likely the chance that resistance to a pest insect will become ineffective because of biotype occurrence. Thus, single gene resistance is generally considered more vulnerable than is multiple gene resistance, to variants in the target pest population that possess a corresponding gene for virulence. The gene-for-gene hypothesis has been elegantly demonstrated in the interactions between genes of Hessian fly and resistant wheat varieties.

PLANT RESISTANCE TO INSECTS IN INTEGRATED PEST MANAGEMENT

Integrated pest management (IPM) incorporates ecological and economical tactics (as best as present information allows) to control pest abundance. These tactics reduce pest abundance by using pesticides, biological control, or temporal or spatial separation of the crop and the pest. Many examples exist that demonstrate resistant varieties of corn, cotton, potato, tomato, rice, sorghum, and wheat increase the effectiveness of insect predators and parasites. Similarly, pest-resistant varieties also complement the effects of cultural controls such as crop rotation, crop refuse destruction, soil tillage, variation in time of planting and/or harvest, plant spacing, fertilizer and water management, and trap crops.

Plant resistance to pests also has advantages over other direct control tactics. For example, plant resistance to pests is compatible with insecticide use, while biological control is not. Plant resistance to pests is not density dependent, while biological control is, and plant resistance is specific, only affecting the target pest. While pesticides are used to treat pest populations, plant resistance to pests is preventive in nature, not remedial. Although pesticides can very effectively suppress pest abundance, their use can cause serious ecological and environmental problems, stated previously.

The "built-in" protection of resistant plants from pests functions at a very basic level, disrupting the normal association of the pest insect with the host plant. In practical terms, the reduction in damage and/or yield loss that results when normal plant/pest associations are disrupted is of significance. The compatible, complementary role that plant resistance to pests plays with other direct control tactics is in concert with the objectives of integrated pest management and sustainable agriculture both in theory and practice. All crop varieties should contain some level of resistance to pests.

INSECT-RESISTANT PLANTS DEVELOPED BY MOLECULAR GENETIC TRANSFORMATION

An explosion of new discoveries in crop plant molecular genetics is underway, and these discoveries are bringing about exciting new insect-resistant crop varieties that are playing major roles in agricultural crop production and protection. Transgenic cotton, potato, and tomato varieties with resistance to damage by leaf-eating caterpillars have already been developed using molecular genetic techniques. Seed of these varieties will be sold, cultivated and harvested by producers in 1996. Transgenic wheat and rice have also been developed and are nearly to the point of commercial sale and production. The resistance factor(s) in all these crops is derived from the gene that encodes plant DNA to produce a crystal protein from the bacterium *Bacillus thuringiensis* (*Bt*). The protein is toxic to insects but fortunately not to mammals.

Much research during the next decade will focus on release strategies for this type of gene product, in order to maximize the life span of hundreds of different kinds of *Bt* resistance genes that may eventually be placed in crop plants. The potential for development of resistance-breaking insect biotypes will follow the development of transgenic resistant varieties, and there is a major need for the development of variety release strategies that avoid the development of biotypes. Such strategies are necessary because of the high potential that exists for the selection of *Bt*-resistant pest populations when crops with *Bt* toxic genes are released for production. Such strategies are especially necessary for pest insects such as migratory moths and beetles that feed on many different crops and that will be exposed to the toxin in several of these crops. The development of these sound strategies will depend on the ability of researchers in government, industry, and universities to cooperatively conduct field experiments that test different kinds of gene (variety) release strategies. An additional factor that will directly affect the success of the development of *Bt* release strategies will be the selection of well-defined, functional IPM systems in which to test the different kinds of release strategies.

DEPLOYMENT OF INSECT-RESISTANT VARIETIES

Biological, economic and sociological factors sometimes mitigate against the use of plant resistance. Certain pests are not of sufficient economic significance to command the time and money required to develop resistance to them. In other cases, financial support of programs in plant resistance to pests has not been available or has been difficult to maintain for the five- to 10-year time span required to develop a pest-resistant variety. The speed at which pest-resistant varieties are improved agronomically and made available to farmers is ultimately determined by the commercial and institutional seed industries, who are responsible for the development of crop varieties from germplasm identified by university and public researchers. Although an increasing number of entomologists and plant pathologists are being employed by seed companies, more need than ever exists for cooperation between industry and public researchers in the development and use of pest-resistant plants.

From a sociological standpoint, though many people in agriculture recognize that the use of pest-resistant varieties is the epitome of applied ecology, their use remains largely unexploited. It is discouraging to note that except for a few dramatic successes, the use of insect-resistant varieties by producers in the United States has been limited at best. Farmer acceptance and continued use of insect-resistant varieties also has been hampered by a lack of proper education and related understanding of plant resistance to pests. Often producers deem resistant varieties undesirable because they may have a lower yield than standard susceptible varieties. In fact, pest resistant varieties generally do not yield less than susceptible varieties. Little, if any, evidence exists suggesting that genes controlling resistance also control yield, or measurabley reduce yield. Producers also often relate resistance to immunity. Limited farmer acceptance of insect-resistant varieties is related to a lack of understanding of the relative degrees of resistance and the desire to avoid risk. The discovery of a procedure that spectacularly controls pests is rapidly accepted, but many insect-resistant varieties have subtle effects on insect pests. Consequently, insect-resistant varieties can be used and will perform well in IPM programs. Educational efforts are needed for producers to comprehend the role and functions of insect-resistant varieties in IPM so they will use resistant varieties as a viable, built-in insect pest management tactic.

FUTURE CHALLENGES

The use of resistant varieties by agricultural producers in the United States remains largely unexploited and key steps are necessary to further their development, acceptance and use. These steps are: 1) Enhanced cooperation between the commercial seed industry and public researchers to develop resistant varieties; 2) Enhanced educational efforts by extension personnel to demonstrate to producers the value of insect resistant crops; and 3) Increased support for research into the understanding of factors that control crop yield. By adapting these educational and research policies, insect resistant crop plants will play a greatly increased role insect pest management programs, reducing production costs and environmental pollution.

Not surprisingly, an urgent need exists for greater and sustained financial support for research and development of insect-resistent crops. With public concern over environmental degradation and reductions in arable land for agricultural use, emphases must be placed on non-chemical, susteinable methods to protect crops from insect pests. The limited amount of financial support allotted for plant physiology and plant breeding research and research on developing resistance to associated plant pest organisms has limited the exploitation of genetic methods to protecting crops, the environment, and natural resources.

Given these cost and environmental benefits summarized at the beginning of this document, insect-resistant varieties have become a component of some of the major food and fiber crop production systems in the United States. In many situations, insect-resistant varieties have been effectively integrated with effective biological, chemical, and cultural control tactics. The advantages of insect-resistant crop varieties offer compelling reasons for greater financial support for the development and use of resistant qualities in all U. S. crop varieties. What better way can the public mandate for abundant food and a clean environment be met than by enhancing the development and use of crop plants with genetically controlled pest insect resistance?

THE EVALUATION OF FEDERAL PROGRAMS IN AGRICULTURAL RESEARCH, EDUCATION, AND EXTENSION

WEDNESDAY, JULY 17, 1996

House of Representatives
Subcommittee on Resource Conservation,
Research, and Forestry,
Committee on Agriculture,
Washington, DC.

The subcommittee met, pursuant to call, at 9:40 a.m., in room 1300, Longworth Building, the Honorable Wayne Allard, [chairman of the subcommittee], presiding.

Present: Representatives Smith, Crapo, Chenoweth, LaHood, Johnson, Minge, and Pomeroy.

Staff Present: Doug Benevento, John Goldberg, Anne Simmons, Curt Mann, Ryan Weston, Callista Bisek, and Wanda Worsham, clerk.

OPENING STATEMENT OF HON. WAYNE ALLARD, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF COLORADO

Mr. Allard. The hearing of the Resource Conservation, Research, and Forestry Subcommittee is called to order for the purposes of reviewing agriculture extension. We have a minority member that we're waiting on but we'll go ahead and proceed and he should be here shortly.

As part of my opening statement, I'd just like to extend to you a good morning and welcome. And, as most of you know, this subcommittee has been engaged in a review of federally supported agricultural research, education, and extension programs. In this context, the subcommittee conducted a comprehensive survey of interested parties. We had the General Accounting Office conduct an in-depth audit of USDA-funded research, education and extension programs; and finally, we've been holding a series of public hearings.

In the first hearing we heard from witnesses regarding the purposes of agriculture research, as well as the methods by which research priorities are established. The second hearing focussed on how research programs are structured and funded.

And today, in this final hearing, we wish to evaluate that aspect of agricultural research where, for lack of a better term, the rubber hits the road, and that's how information obtained from research is managed and disseminated to the customers.

On May 8, 1918 Congress established a Cooperative Extension Service in order to, and I quote from the original authorization, "provide for cooperative agricultural extension work between agricultural colleges in the several states receiving benefits," which is from the Morrill Act of 1862, "and the Acts supplementary thereto, and the United States Department of Agriculture."

Under the authority of this act, Congress directed that, and again I quote, "cooperative agricultural extension work shall consist of the development of practical applications of research knowledge and giving of instruction and practical demonstrations of existing or improved practices or technologies in agriculture, home economics, and rural energy, and subjects related thereto."

As we see, the language of the original authorization provided the Extension System with a tremendous amount of flexibility to respond to the emerging needs of American agriculture and rural communities, as well as the ability to expand its programs to address the problems of urban communities.

As a result, the Extension Service model is envied worldwide and has been copied by many other countries.

I think most members would agree that in a perfect world, forward-thinking legislation such as this is the best kind of legislation. However, I think we would also agree that in a situation where resources are limited, no single program can be all things to all people.

For instance, the Act of 1914 provided a legislative mandate that the Extension Service establish programs in home economics. From that perspective, if these programs focus on food and agriculture issues such as food safety, diet, nutrition, and health, they seem to fit in with the mission area of the USDA. Programs with a strong urban focus, however, are not issues that we would normally expect to fall under the mission of the USDA.

Let me be clear on this point. The USDA budget is shrinking. As a result, we must continue to ask ourselves where we can spend the valuable resources that remain to address the unique problems of small town, rural America such as economic and information isolation. In answering this question, I would certainly argue that there are other, more qualified agencies to work on the problems facing urban America.

As we consider today how the Extension Service is functioning, we must not lose sight of the fact that one of the Service's greatest strengths lies in the original statutory mandate that this service be administered as a partnership between Federal, State and county Governments and our land grant universities.

While previously I suggested that some of the activities of the Extension Service may fall outside what I perceive to be the mission area of the USDA, I acknowledge that these programs were developed as a result of a truly inclusive priority-setting mechanism that starts from within the system and attempts to address the needs of all of its partners.

The question, then, is how do we build upon the historical success of the Extension Service while keeping in mind the fiscal constraints that decades of unrestrained spending may have placed on us.

With that, I invite all of our witnesses to address not only what Extension is doing well, but also how we can work together to see that the needs of our Nation's farmers and ranchers can continue to be met in light of the changes in global trade policy, a new commitment to setting budget priorities, and the inherent changes in the way people live.

I now recognize the ranking member for his opening comments.

OPENING STATEMENT OF HON. TIM JOHNSON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF SOUTH DAKOTA

Mr. JOHNSON. Thank you, Mr. Chairman, for holding this, the third and final in a series of hearings on the research, education and extension infrastructure in our country. The Cooperative Extension Service continues to be one of the most important programs carried out by the Department of Agriculture, as witnessed by the commitment that State and local Governments have to providing funding. As we all know, there is no greater test of a program's success and support than providing funding for it in a day and age of tight budget levels at every level of Government.

I think it would also be a safe bet that more of our constituents have had some interaction with the Extension Service than with any other sector of the research and education infrastructure. As Mr. Luft will reiterate during his testimony, the majority of their activity still involves hands-on work with farmers and ranchers, but I believe, as I hope most of my colleagues do, that the Extension Service is there to serve all rural residents, as well as those urban dwellers who are fortunate enough to have programs available in their regions.

One of the reasons that urban areas clamor to have Extension Service programs operating in their jurisdictions is that they know how successful these programs are and what an important difference they can make in people's lives.

Another important but often-overlooked benefit of the Extension Service is the development of leadership in rural areas. This is an activity that does not easily equate itself to a dollar figure. But those involved in rural development activities at all levels will tell you that no matter how much money you may have involved in a project, local leadership and initiative are what ultimately will make or break the success of a community in its efforts to survive and prosper.

As you can tell by this statement, the Extension Service is an important entity in my home State of South Dakota and I've been pleased to support it during my time here in Congress and as a member of the South Dakota Legislature.

I appreciate the chairman giving me the opportunity to make this opening statement and I look forward to the testimony of the witnesses. Thank you, Mr. Chairman.

Mr. ALLARD. Thank you Mr. Johnson for your opening statement.

Are there any other members who would care to make any statements? Mr. Crapo.

OPENING STATEMENT OF HON. MICHAEL D. CRAPO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF IDAHO

Mr. CRAPO. Thank you, Mr. Chairman. I'll be very brief.

First, I'd like to welcome my fellow Idahoan, Mr. Luft here today. I think his presence here indicates how important the Extension Service is to the State of Idaho and to the many agricultural areas of the country that depend on the effective and prompt access to information. And the ability of our agricultural community in this country I think is significantly enhanced and has been and hopefully will continue to be enhanced by the ability that the Extension Services provides to get that quick, prompt access to reliable information about the best ways to proceed.

I think there are a couple of other points that need to be emphasized about the Extension Program. The model, as Mr. Luft says in his testimony, the model of collaborative decision making that the Extension Service has already organized and implemented is one which I think can be used effectively in many other areas of Government, particularly as we look for ways to move decision-making back to more local levels. This is the type of approach to Federal partnership support that works.

This intensifies, however, and refocuses the importance on the need of getting this information out quickly. And as our committee focusses on how to do that best and we move into the computer age and the technology that is advancing so rapidly, I think it's very important that this committee recognize the tremendous benefits that we can assist in promoting in the country as we properly structure and support this system.

Thank you, Mr. Chairman.

Mr. ALLARD. I thank the gentleman from Idaho for his opening comments.

We'll proceed on with the first panel. We're pleased to invite our first panel to the table. Our witnesses are Dr. Cathy Woteki, who is the USDA Acting Under Secretary for Research, Education and Extension. She's accompanied by Dr. Bob Robinson, who is the Administrator of the Cooperative State Research, Education and Extension Service.

As always, each witness's complete statement will be made a part of the record and we'd be pleased to receive your testimony at this particular point in time.

You have some lights there in front of you. You both have been subject to their discipline. The green light means it's okay. Yellow cautions you; you've got a minute to wind up your comments. Then the red light, we'll ask you to stop your testimony. But keep in mind that your full testimony will be a part of the record.

Dr. Woteki.

STATEMENT OF CATHERINE E. WOTEKI, ACTING UNDER SECRETARY, RESEARCH, EDUCATION AND ECONOMICS, U.S. DEPARTMENT OF AGRICULTURE

Ms. WOTEKI. Thank you, Mr. Chairman. It's certainly a pleasure to be here again to talk about, this time, the education and extension and information activities of this mission area of the Department of Agriculture.

In addition to Dr. Robinson, also with me today are Dr. Floyd Horn, the Administrator of the Agricultural Research Service; Dr. Susan Offutt, the Administrator of the Economic Research Service; and Mr. Don Bay, the Administrator of the National Agricultural

Statistics Service. In the process of our questions and answers, should some very detailed questions arise, I'd like to be able to call on them to provide you with some immediate answers.

At the last hearing in May, Mr. Chairman, we emphasized that the passage of the Federal Agriculture Improvement and Reform Act, or FAIR 1996, with its increased reliance on markets, makes research in support of the American food and agriculture system more important than ever. And we continue to believe that our investments—whether they be Federal, State or private—in research, education and economics, are central to enabling farmers to compete in domestic and international markets.

Certainly the research and the statistical collection activities of the Department can make major contributions to securing America's future by providing the scientific basis for new technologies and by providing access to information, as well as risk management tools that are needed in this new environment.

At the same time, the programs of the research, education and economics mission area address a broader set of concerns that are important to American society—consumer health and food safety, environmental protection, and rural quality of life—on which consumers, producers and taxpayers expect good information.

Today our discussion will focus on the dissemination of the results of our research program through a variety of different mechanisms. On the one end of the spectrum of mechanisms that we use for information dissemination are the Extension Programs, which provide one-on-one, person-to-person communication in an informal educational setting.

On the other end of the spectrum, consistent with the advances in modern technologies, our agencies and Extension personnel provide access to agricultural information to an even broader audience via new electronic communications, particularly the World Wide Web and the Internet.

Mr. Chairman, I'd like to invite you and your colleagues and the staff here later today to a demonstration of some of these new information technologies that will be held here in the Longworth Building from 5 o'clock to 7 o'clock in room 1302.

The testimony that we've provided today is organized around three groups who are the major beneficiaries of our activities: private producers and consumers, public policy and program officials, and scientists, educators and other professional groups.

First of all, with respect to the information systems for producers and consumers, one of the most compelling reasons for Federal support of agricultural research is its potential to help individuals to make decisions that affect their livelihoods, their health, and their families.

The private sector has little incentive to address many of these important questions and rapid advancements in communications technology and distance education offer public institutions tremendous opportunities to increase the effectiveness in the use of our program funds and to share our expertise to meet consumers' needs and our customers' needs.

One example that we'll be demonstrating later this afternoon is how we make this kind of information available through the home pages of our various agencies. Currently more than 500 USDA reports each year, as well as thousands of data files covering all aspects of domestic and international agriculture, agricultural economics and rural affairs, are made available through this route.

Another example is the reinvention labs under the Reinventing Government initiative of the Vice President. Under this initiative, CSREES is providing access to resources such as information about USDA's emergency programs, health care reform, new school lunch regulation, NAFTA- and GATT-related information, as well as daily up-to-date information and summaries of current events.

With respect to the second audience, information systems for managers and policy-makers, agricultural markets work best when all participants have equal access to sound economic information. The NASS and ERA provide statistical data on and analysis of current situation and outlook conditions and a variety of other economic information and statistical information that contributes to an orderly development of production and marketing decisions by farmers, ranchers and other agribusinesses.

We appreciate, Mr. Chairman, very much the work of this committee earlier this month and of the full committee in the markup and report to the House of a bill, H.R. 3665, to transfer authorities for the Census of Agriculture from the Department of Commerce to the Department of Agriculture. This is yet another source of information about the agricultural sector that will be extremely important to us. We're hopeful that the bill will be included on the suspension calendar very soon.

Lastly, with respect to information systems for scientists and professional educators, Dr. Robinson will be addressing a number of different activities in this area. I'd like to highlight one of them, the ARS Germplasm Resources Information Network, which is part of the National Germplasm System's computer database. It contains information on all genetic resources preserved by the National Plant Germplasm System and is extremely important to our future world security.

In conclusion, there are a number of additional programs that Dr. Robinson is going to highlight in his testimony that relate to these three different beneficiaries of our information programs and I thank you very much for the opportunity to discuss the importance of the dissemination of our research results. As I had indicated to you, we will be happy to answer any questions that you may have during the question and answer period.

[The prepared statement of Ms. Woteki appears at the conclusion of the hearing.]

Mr. ALLARD. Thank you, Doctor.

Dr. Robinson.

STATEMENT OF BOB ROBINSON, ADMINISTRATOR, COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE, USDA

Mr. ROBINSON. Thank you, Mr. Chairman. I am very pleased to be here today to discuss the very unique partnership between Federal, State and local levels in delivering educational programs and to be able to discuss the uniqueness of that partnership and its tremendous contributions, as you and others have pointed out, to the growth in rural areas, to the change in agriculture, and to the efficiency that this country enjoys, but not to look at the past legacy but look, in fact, at the future, where this organization, this cooperative Federal, State, local partnership can make major contributions to future developments and to the needs to solve problems of people in rural areas in the future.

The goal of the Cooperative State Research, Education, and Extension Programs at USDA is to sustain a viable food and agricultural system that enhances economic opportunities, reduces risk for producers and consumers, competes aggressively in a global economy, affords a safe and secure supply of food and fiber to all Americans and maintains a quality environment.

The Cooperative Extension System's efforts to enable people to improve their lives and communities through partnerships that put knowledge to work are central to achieving these goals. The Cooperative Extension System promotes partnerships with and among people and their local settings and provides access to research-based knowledge of a practical nature that they can use to address the problems that they face, in fact, in teaching them to solve their problems, not in solving those problems for them in this rapidly changing world.

Let me digress for just a moment because I was at a meeting in the past couple of days where a gentleman presented the results of a study that looked at information change. The information that he presented concluded the following.

At the turn of the century, information was doubling about every 100 years. At the turn of the next century, information will be doubling in less than a year—some sense of the tremendous information overload that people face in trying to make decisions.

Extension has a number of base programs that are the major educational efforts that comprise the core mission of CES and are common to most Extension units. Each base program focusses on a single subject matter but encompasses, in fact, many disciplines and drives off of what you laid out, Mr. Chairman, this morning, the original mission of Extension.

Those are agriculture, natural resources and environmental management, nutrition, diet and health, community resources and economic development, 4-H and youth development, family development and resource management, and, as was pointed out, leadership and volunteer development.

In addition, off of that base, which provides the information, expertise and organizational infrastructure to allow programs to address local problems, certain initiatives are decided upon annually through a priority-setting process moving both from the local level and from the Federal level, as problems are addressed and the importance of those problems.

Some of those current national initiatives are children, youth and families at risk, managing change in a rapidly changing agriculture, food safety and quality, communities in economic transition, water quality, sustainable agriculture, decisions for health.

While traditionally, Cooperative Extension personnel have engaged in one-on-one education efforts, increasingly their role is to function as organizers, facilitators, information brokers and networkers, in order to be able to provide people the kind of information they need to solve problems.

This new function emphasis is encouraged in the March 6, 1996 Congressional Research Service Report to the Congress. It also is part of a recently released Agricultural Research, Education and Extension report dealing with "Charting the Course for the Cooperative Extension System."

Cooperative Extension is the information broker and the information dissemination and education arm of the Department of Agriculture. Within that and within this concept of information overload, if you will, let me point out a few of the very significant information dissemination programs that Cooperative Extension is in either as an agency, as a cooperative system, or, in fact, in partnership with other agencies.

One is the Agriculture Databases for Decision Support developed by Extension personnel at USDA, several land grant universities and in partnership with local needs. This system is designed to help farmers address problems by accessing information and decision models that are available.

Another notable example of a decision aid to help farmers is FARM*A*SYST, which is used to assess farms and farmsteads for their potential pollution problems. Private landowners have completed more than 22,000 assessments with FARM*A*SYST and, as a result, have invested more than $15 million in pollution prevention practices. This is a system done in partnership between Federal and State partners and Extension, USDA's Natural Resources Conservation Service, and the Environmental Protection Agency.

Additionally, we are working and partnering with the Argonne National Laboratory to be able to develop a decision support system applicable to integrated pest management.

The CRIS, our traditional database, designed to be able to share information among researchers in terms of what was going on, what were the objectives and what are the results, to avoid duplication and to provide an information source for researchers.

The system has had many more demands, demands, in fact, that go well beyond the original purpose, the original concept of CRIS and its ability to respond. And that was recognized by Congress in Section 804 of the Federal Agriculture Improvement and Reform Act of 1996. You directed us to revise the system, to develop a system within RE to address those needs.

We are well under way in doing that, have invested some agency money and have, in fact, a task force already appointed to develop the initial ideas to implement your desires.

Let me, once again, echo the invitation of Dr. Woteki to attend the demonstration this afternoon. It will give you a better idea of the many decision support systems that are available to us.

Thank you very much and I'd be willing to answer the questions that you may have.

[The prepared statement of Mr. Robinson appears at the conclusion of the hearing.]

Mr. ALLARD. Thank you. I'd like to thank both of you for being here.

Dr. Woteki, there was an Extension Service planning activity earlier this year that resulted in a report called "Charting a Course for the Cooperative Extension Federal Agenda."

My question is what were the recommendations of that group and what follow-up actions have resulted from that report?

Ms. WOTEKI. As you may know, the group was tasked to essentially address a question that the President raised last summer or spring during the Conference on Rural America about what is the proper role for Extension in the 21st century. The report was developed by a working group that consisted of people from across the country and in March Dr. Robinson appointed an Extension Implementation Working Team to begin to implement the recommendations.

The recommendations are actually of two different types. One set of recommendations are for the Federal partner, the Cooperative State Research, Education, and Extension Service, and the second set of recommendations are for the Cooperative Extension System.

The recommendations, to give you some examples, not to be exhaustive about what the nature of the examples is, but the first recommendation, right off the bat for the Federal partner, is that we are to advocate to the various stakeholders, especially Congress, in hearings such as this one, the impact and the value of the Extension funding partnership and infrastructure.

Additionally, recommendations for the Federal partner are to identify programs which may be supported by USDA Extension formula funds and for which State and local Extension offices are accountable.

We are also to identify anticipated outcomes and requirements for accountability for Extension programs supported by USDA funds.

This gives you a flavor of the kinds of recommendations that were made for the Federal partner. If you'd like, I can go into some examples, as well, of the recommendations for the Cooperative Extension System.

Mr. ALLARD. Well, I would just let you know that we will be looking closely on some follow-up actions from the report. I hope, and I realize that in this committee you can't go into a lot of detail as to what's been going on, but I raise the question just to let you know that it's something that we have reviewed and would like to see how it gets spelled out in the coming years.

Ms. WOTEKI. Well, knowing of your interest, sir, we'd be happy to provide you with information as the working group that Dr. Robinson has appointed continues its work.

Mr. ALLARD. If you'd do that to the committee staff, particularly Mr. Benevento, I'd appreciate that.

Ms. WOTEKI. Certainly.

Mr. ALLARD. I'd like to now recognize the gentleman from North Dakota.

Mr. POMEROY. Mr. Chairman, I thank you for calling on me out of order. Because, like you, I'm also a member of the Budget Committee and that committee is meeting concurrent with this one, I'd simply like to offer for the record an opening statement. Attendant to the opening statement is a statement from Sharon Anderson, director of the North Dakota State University Extension Service, with specific information about the mission of Extension in North Dakota, particularly in dealing with some of the production issues raised this crop year. And I thank you, Mr. Chairman.

Mr. ALLARD. Your statement will be made part of the record.

[The prepared statement Mr. Pomeroy follows and the statement of Ms. Anderson appears at the conclusion of the hearing:]

STATEMENT OF HON. EARL POMEROY

Mr. Chairman, I want to thank you for holding this hearing on the important work conducted by the Extension Service. Extension Programs have been a vital component of our agricultural system in this nation and the envy of other countries the world over. I am glad we have this opportunity today to hear about the excellent and important work being conducted by extension experts across the country and to think about the Extension program of the future.

In your packets of testimony you will find a statement from Dr. Sharon Anderson, North Dakota Extension Director. She explains in detail the impacts that Extension Programs have on the lives of North Dakotans. I am proud to share the successes of North Dakota Extension with my colleagues on the Committee. I will take just a few minutes and highlight some of these programs.

In the past year North Dakota has been hit by the Orange Wheat Blossom Midge. This insect attacks the wheat plant at the time of flowering and causes substantial yield and quality loss. In this year of high prices, producers were faced with the prospect of not having a harvest due to the activity of this insect. In response, the North Dakota Extension Service developed a program to educate producers to identify and control the insect using integrated pest management strategies, techniques this Committee has been promoting. Using internet discussion groups and interactive satellite training sessions the Extension Service, in cooperation with private crop consultants, and individual producers, has been able to link North Dakota producers in a network of information that has significantly reduced the impact of the midge outbreak this year. Many farmers in northeastern North Dakota now have the opportunity to harvest their first good crop in almost three years.

Extension, however, as we all know is more than farming. North Dakota Extension is also about outreach to young adults, especially through the 4-H program. While the traditional focus on project steers and state fair contests remains a mainstay of the program 4-H is also one of the most popular and effective programs for developing leadership and creativity for my state's young people. North Dakota Extension reaches approximately 50 percent of the teenage population in the state. This afternoon I will be meeting with several 4-H students who are attending a week-long citizenship seminar here in Washington. Several of my present and former staff members attended this same program in years past.

Clearly, in North Dakota Extension serves many valuable roles. Nationally it is a bargain with Federal funds representing usually less than 30% of individual state's Extension budgets. It is a program that knits many rural communities together whether it is at the county fair livestock judging ring or the extension field day describing the latest crop variety or farming practices. Of course Extension must constantly renew itself and change with the times, but the services extension experts provide remain as necessary today as they were the day the Smith-Lever Act establishing the Extension Service was signed into law.

Mr. ALLARD. Now I'll recognize Mr. Johnson.

Mr. JOHNSON. Thank you, Mr. Chairman.

Ms. Woteki, several of my colleagues have introduced legislation in the past week regarding precision agriculture. I would be interested in your comments regarding whether you've had an opportunity to review that and, in particular, the provisions in the bill that would expand the mission of the National Research Initiative to fund education and extension activities. Do you or the Administration have a position on expanding the scope of the NRI in general?

Ms. WOTEKI. In response to your very specific question, do we have a position yet; the answer is no. We have obtained a copy of the bill. We're in the process at this point of reviewing it.

I might say at this point, though, that we would be concerned about expanding the NRI's mission beyond its originally intended

I might ask, though, if Dr. Robinson would have an additional comment on this issue.

Mr. JOHNSON. Dr. Robinson.

Mr. ROBINSON. Thank you. My comments would just be a follow-up to those of Dr. Woteki and would deal with two issues.

One issue, as you know, Congress has chosen to put several line emphasis areas within the NRI, but they're very general and they don't refer to any specific element. There was put in a footnote which refers to all of them some time ago dealing with sustainable agriculture. Then this is a potential, and I haven't read it enough to know exactly where it goes, in the bill to do the same thing.

I guess the question that I would raise would be the following: whether or not we want to continue to segment various portions of the NRI to be directed to very specific purposes or leave the flexibility in the NRI to address the broader range of research areas while keeping in mind, whether we're dealing with sustainable agriculture, precision farming or a number of these items, have to be part of the relevance consideration for any proposal that comes to the NRI.

Ms. WOTEKI. I might add, Mr. Johnson, that as you can see, the bill has just been introduced, we're in the process of reviewing it, having some internal discussions about the development of a position. But I would also like to reiterate the importance that we think that precision agriculture and research in support of precision agriculture has as far as future contributions to agricultural productivity.

Mr. JOHNSON. Very good. And as this issue evolves, we have both a policy and a budgetary issue intertwined here, and I appreciate your insights on it and will continue to follow this very closely.

I would yield back, Mr. Chairman.

Mr. ALLARD. I have several other questions. Since there's just two of us right here on the committee at the present time, I'll have some that I'd like to address to Dr. Robinson.

My understanding is that private landowners are making a concerted effort to give more technical assistance in grazing, land issues. And how is Extension working with the Farm Service Agency and the National Resource Conservation Service to assure that the best programs are being developed?

Mr. ROBINSON. Yes, sir, Mr. Allard. We certainly are. We have been working with the steering committee on dealing with the grazing lands initiative. That steering committee began with an emphasis on phase 1, as you point out, which is to actually increase the technical assistance primarily through NRCS, at the local level, to deal with grazing land issues, private grazing land issues.

That steering committee had representatives both from the system itself as well as from my agency as it began to look at the initiation of that program and there is some debate continuing between myself and the individuals responsible for the program in NRCS to increase the cooperation between the Cooperative Extension System and the agencies responsible for that program and what is termed phase 1, which is the technical assistance phase.

Phase 2, which is the educational and research phase, USDA, both my agency and ARS, and Dr. Horn and I have met with a group from the steering committee and have been briefed and we are currently working to put a member on that committee, not in an advisory capacity, as was the case in phase 1, but a full voting member, to begin to look at the research needs and educational needs in cooperation with NRCS and FSA and moving into the next phase of that project.

Mr. ALLARD. The grazing initiatives and Grazing Land Assistance Program was a new provision in the FAIR Act. Another new addition there had to do with the Environmental Quality Incentives Program.

So I'd like to have you address this committee a little bit on—and both of them, by the way, referenced education—I'd like to have you say a little bit about what's happening through the Extension Service in administering the Environmental Quality Incentives Program.

Mr. ROBINSON. Thank you, Mr. Chairman. That program, too, is one that involves several agencies within the Department and actually means that we need to cooperate more fully in developing and implementing the provisions of that section.

We have been working again with NRCS and with the Farm Service Agencies to ensure that we have as integrated a program as possible and that we are providing—and the Cooperative Extension Service at the State and local system has been working with local NRCS staff to carry out the specifics of that program.

We are also working in terms of looking at the next phase of that, and I've just signed off with the Administrator of NRCS and FSA with a new issue paper that looks at an integrated approach between Cooperative Extension, NRCS and the Farm Service Agency in ensuring that we address the provision of that particular section.

Mr. ALLARD. There's an astounding figure, I think, in Extension, and just in agriculture in general. We have about 85 percent of our products being produced by 15 percent of the farmers out there and you've got the other 85 percent of the farmers who produce 15 percent. And I think this perhaps creates somewhat of a dilemma. We're talking about maybe the gentleman farmer as opposed to the full-time farmer here.

How do you set your priorities, particularly in those areas where you have a growing urban population who wants to go out into the medium or small size farm and actually have another job?

Mr. ROBINSON. Priority-setting within the Cooperative Extension System and in partnership with the Federal agency is probably one of the more organized priority-setting systems that we have in these kinds of partnerships today.

There exists within Cooperative Extension, with both State and Federal partners, both a strategic planning committee and other committees related to developing the kinds of priorities bubbling up from the needs identified at the local level and how those needs begin to fit into a set of programs, be they both changes in the base programs that I outlined in my written testimony and in new initiatives that would be coming down the pike to address specific issues.

For example, Integrated Pest Management, a new initiative that we have under way at the moment, is Managing Change. Managing Change is the initiative that has been developed with three emphasis areas. The first emphasis area is in integrated animal systems and the problem that animal agriculture is having at the moment adjusting to the rapidly changing structure, market and environmental environment.

The second one deals with marketing systems, how to help farmers address the many changes that are occurring, things like the information overload that I mentioned a moment ago, and trying to make the decisions they need to to be competitive in today's environment.

And third, dealing with conservation, which incorporate some of the concepts in both ECWIP and the Grazing Lands Initiative.

All of those are a combination of priority-setting between local and national needs that come together in many of these strategic planning committees.

Mr. ALLARD. What is your World Wide Web site address?

Mr. ROBINSON. I cannot give that to you off the top of my head but we will certainly provide it to you.

Mr. ALLARD. Would you do that? I assume that we can go into this. You get all the documents you'd ordinarily go into the Extension office and get, you can just get them printed onto your printer from that? Is that correct?

Mr. ROBINSON. I wish we were to that place. We do not have the kind of access that I think perhaps you're referring to. That's part of what I outlined a moment ago and the son or daughter of CRIS and the enhancement of a broader-based RE information dissemination.

Mr. ALLARD. So what you have right now is basically just kind of a promotional window there saying what you do, but you don't provide any printed materials yet?

Mr. ROBINSON. We can provide it for research. We just don't have it for extension. That system has not been fully integrated into this kind of information dissemination.

Mr. ALLARD. I understand.

Okay, we're all finished with this panel unless Mrs. Chenoweth has any questions to direct to this panel.

Mrs. CHENOWETH. Mr. Chairman, I have no questions but I do have a statement that I would like to enter into the record.

Mr. ALLARD. Without objection it is so ordered. Any other comments?

[No response.]

Mr. ALLARD. Very good. We'll go ahead and call the second panel. At this time we're pleased to welcome our second panel to the table. Our witnesses are Dr. Leroy Luft, who is chairman of the Extension Committee on Organization and Policy; Dr. Sam Donald, who is the regional director for 1890 Programs; Mr. Tom Guthrie, who is representing the Sustainable Agriculture Coalition; Dennis Avery, who is director of Federal Food Issues for the Hudson Institute. Dr. Gary Weber is representing the Animal Agriculture Coalition and Mr. Kenneth Rose is the vice president for Research and Education with the National Grain Sorghum Producers; and finally, Mr. Dean Urmston, who is the executive vice president of the American Seed Trade Association.

Dr. Luft, when you get ready you may begin.

STATEMENT OF LEROY LUFT, CHAIRMAN, EXTENSION COMMITTEE ON ORGANIZATION AND POLICY

Mr. LUFT. Thank you, Mr. Chairman and members of the committee. I am Leroy Luft. I'm extension director at the University of Idaho and I also chair the Extension Committee on Organization and Policy, which is the policy board of the cooperative extension directors across the country.

I'm particularly pleased to be able to testify and visit with the committee, particularly since both of Idaho's Representatives are members of this committee.

ECOP was one of several organizations that was invited to submit responses to the 57 questions and we did that, so my comments today will merely complement or supplement those comments. We appreciated the opportunity to be able to provide responses to those questions.

ECOP is the key link from the various State extension services to our Federal partner, CSREES. ECOP, as a board, works with the Federal partner on issues of strategic planning, as Dr. Robinson mentioned, priority-setting, as well as organization and policy issues.

Realizing the time constraints, I'd like to just highlight a few points from my testimony. At the very close of my testimony, written testimony, I have put in a word of thanks to the committee for one of the issues that we had raised as the earlier part of the farm bill had been developed.

In subtitle D, Section 883 of the farm bill, you have responded positively, and we appreciate that, to one of the requests that we made, and that was to make the 1890 Institutions eligible for the 3(d) funding. We have felt that to be important and we think that is a very positive step for the system.

Mr. Chairman, you went through a number of the components of the authorizing legislation and I would merely add to that that the current mission of the Cooperative Extension System, with the State partners, is to enable people to improve their lives and communities through learning partnerships that put knowledge to work. Our role is education and our emphasis is to extend the research conducted by USDA and by the land grant universities to help people in the communities solve their problems.

I think that job has been done. The average consumer now pays only about 8 percent of their annual income for at-home food costs. Our Nation's producers of food provide a very safe and reliable supply, not only for this country but for a lot of folks overseas, as well.

I mentioned in my testimony the partnerships between the 74 land grant institutions, the 50 States, as well as the territories and some 3,000 counties that participate in this program. And I cannot fail to mention the support that we receive from approximately 3 million volunteers as they work with us, not only in 4-H but in many of the other programs that we conduct throughout the system.

Mr. Chairman, members of the committee, there's been some discussion regarding Federal funding mechanisms and we feel that the current system of funding and the current mechanism is very appropriate. The tripartite funding, coming from the Federal, the State and the counties, with each three entities, of course, having a say and input into the priorities that we should be programming around, as far as our States are concerned.

We appreciate very much the base formula funding, as well as the 3(d) funding, with the formula funding serving as the basis, the infrastructure to allow us to address the very important issues that arise in our system as we develop the special initiatives and the special programs.

We must remember that our State legislative assemblies are very strong players in this entire process, as is the county government and, in some cases, city governments, providing funds for extension in urban areas. This tripartite approach to funding is very important and it helps us, I think, focus on the priorities of the needs of the people.

So we highly recommend and encourage that the Federal funding policy mechanism for the State Extension Service not be changed. It has stood the test of time for some 80-plus years. And while there have been discussions over time to change it, we would encourage that it remain as it is.

It has been mentioned earlier this morning about the issues of priorities and where programming is done, and some people have said that we have stepped away from agriculture. I would point out that in 1973 about 38 percent of the resources were allocated to agriculture. This has increased to where it is now about 47 percent. And basically the reductions have come in the youth and community development area.

As we look to the future, Mr. Chairman, we see that we have an increasing role as it relates to the new farm bill, the Freedom to Farm, to work with farmers in areas of risk management and marketing. Our producers tell us that they do not need help to raise another bushel or two of wheat as much as they need help to get rid of the wheat and to deal with the issues that now will be upon them in terms of how they make decisions in a new framework.

We are in the process of improving our communications technology and our ability to have people access the information that we generate. And while we're not there yet, we are working very hard on this and we'll continue in that regard.

Mr. Chairman, I appreciate the opportunity to present this information.

[The prepared statement of Mr. Luft appears at the conclusion of the hearing.]

Mr. ALLARD. Thank you, Doctor.

Mr. Guthrie.

STATEMENT OF TOM GUTHRIE, REPRESENTING THE SUSTAINABLE AGRICULTURE COALITION AND THE MIDWEST SUSTAINABLE AGRICULTURE WORKING GROUP

Mr. GUTHRIE. Thank you, Mr. Chairman and members of the subcommittee. Thank you for this opportunity to testify. My name is Tom Guthrie and I'm a diversified family farmer from Delton, MI. I farm approximately 1,000 acres. I'm active in the Michigan Farm Bureau and currently serve as vice president of the Michigan Farm Bureau and Chairman of the State Policy Development Committee. I also serve on the board and am former president of the Michigan Agriculture Stewardship Association.

I also just completed my 4-year term and last year as chair of the North Central Region Administrative Council. It certainly has been an honor and a learning experience to serve as Michigan's representative on this council. The council's responsibility is to carry out the USDA's Sustainable Agriculture Research and Education Program. The SARE Program includes a strong extension component, which will be the focus of my comments this morning.

I appear today on behalf of the Sustainable Agriculture Coalition and the Midwest Sustainable Agriculture Working Group. I want to thank the Working Group and Coalition for inviting me to be with you today.

I imagine that I agree with many of the witnesses before you today that maintain that Federal investment in agriculture research, education and extension is critical to simultaneously enhancing productivity, profitability, and economic opportunities in family farming and rural communities and preserving the natural resource base.

I would like to highlight two programs for the subcommittee which, in my estimation, are among the best examples of how Federal research and extension investments can leverage local resources for positive change.

The Sustainable Agriculture Research and Education Program is a competitive grants program designed to respond to the pressing need for research and demonstration about practical and profitable alternatives for farmers and ranchers who are operating within an expanded set of economic and environmental constraints. The program is implemented on a regional level by four regional administrative councils, each with its own technical review committees. Representation on administrative councils and review committees includes Government, scientists, educators, farmers and ranchers, private, nonprofit organizations and agribusiness.

Most SARE research projects use a team approach. Emphasis is placed on whole farm systems research, as well as component research in the context of farming systems. In the context of today's hearing it is important to note that since the beginning, SARE has required the integration of research and extension within its projects.

SARE projects also are required to incorporate strategies to ensure that findings are made readily available to producers. This encourages extension and local agricultural networks and organizations to find new and innovative ways of getting information into the hands of potential end users.

Since its inception, SARE has placed heavy emphasis on having farmers and ranchers provide leadership as project participants, project reviewers and administrative council members, side by side with scientists and agency representatives.

As a note, the North Central SARE Council insists, to the extent possible, that the projects be carried out on a working farm. In my opinion, this has been a key to its success. Each of the four SARE regions has also instituted a producer grant program in which small, competitive grant awards are made directly to farmers.

These investments are already paying dividends. In the North Central Region, for example, we have funded approximately 1,000 such projects among the 12 States and we do insist that they share the lessons learned with other producers.

As part of the overall SARE program, Congress created a Sustainable Agriculture Technology Development and Transfer Program in the 1990 farm bill and funded it for the first time in fiscal year 1994. The portion of the program currently being implemented is now commonly referred to as the SARE Professional Development Program. The Professional Development Program is nationally coordinated and State and regionally based. Training consortia networks have been established in all four regions of the country to coordinate education activities and offer instructional programs for extension and others who have an educational responsibility for sustainable agriculture.

As part of this program, each State has named a sustainable agriculture extension coordinator and initiated a sustainable agriculture strategic planning process with broad participation from many different stakeholders. All States' strategic plans were completed in 1995 and are now proceeding with implementation plans and activities.

I'm pleased to report that in my State, Michigan, implementation of this Professional Development Outreach Program is being carried out as a partnership between Michigan State University Extension and Michigan Agriculture Stewardship Association and the State Office of the Natural Resources Conservation Service.

The three entities entered into a cooperative agreement in June of this year to jointly undertake training and education responsibilities in theory, practices and systems of sustainable agriculture. The program will consist of 15 professional development modules, community leaders, along with farmers and ranches, who will become teachers, as well as learners, through this endeavor.

I'm excited about the prospects of this innovative public-private partnership. Both Extension and NRCS will benefit, I believe, from working with farmer networks as facilitators and informational brokers, rather than as resident experts. The Michigan partnership reflects this new thinking about the role of extension.

With more adequate funding, the Technology Development and Transfer Program should become a natural outlet for information gathered by the SARE and related USDA science and education programs. At the same time, farm level priorities and feedback through the programs' outreach efforts should help inform the research agenda.

Before closing my comments today, I want to call the subcommittee's attention to a number of extension-related recommendations of the recently released National Research Council reported entitled "Land Grant Colleges of Agriculture: Public Policy and Public Service." The Council recommended that receipt of USDA-administered research and extension funds should be contingent on bringing a wide variety of stakeholders into a process of systematic prioritization of research and extension issues.

Significant shares of all total USDA funds, including Extension, should provide incentives for regional centers, consortia programs and projects that effectively integrate and mobilize multi-State and multi-institutional resources.

Federal funding for research and extension should be combined into a single allocation.

All national extension initiatives should be available on a competitive basis.

I am struck by the congruence between the Council's recommendations and the current status of the SARE program. Multiple stakeholders are a built in feature of the SARE partnership. The programs are regionally based and extension programs work through regional consortia.

More so than any other USDA research and extension program, research and extension components are closely coordinated. A strong emphasis is placed on interdisciplinary systems projects. And last but definitely not least, all funds are available on a competitive basis.

After reading the Council's recommendations, it seems increasingly clear to me that the SARE program is on the cutting edge of where more federally-funded agricultural research and extension programs should be headed. I am encouraged by the progress being made in this program.

In the next few years, USDA and Congress should work together to give greater priority to this type of partnered agricultural research and extension in general and these innovative programs in particular. extension, at its best, can help farmers access and integrate management and farming systems knowledge and undertake educational efforts on decision-making skills and support systems.

Extension should also consider more widespread adoption of working with farmers and agricultural farm organizations to facilitate farmer research, information sharing and collective problem-solving.

It is my strong hope that the SARE program, especially the Professional Development Program and related outreach, will play a key role in some of these efforts and in defining the future for agriculture extension programs.

I do want to thank you again for this opportunity to testify and I'll try to answer any questions.

[The prepared statement of Mr. Guthrie appears at the conclusion of the hearing.]

Mr. ALLARD. Thank you, Mr. Guthrie.

Mr. Avery.

STATEMENT OF DENNIS T. AVERY, DIRECTOR OF GLOBAL FOOD ISSUES, HUDSON INSTITUTE

Mr. AVERY. Thank you, Mr. Chairman.

I'm here this morning to reemphasize the importance of the original task of the Extension Service in raising agricultural productivity. My father was an extension agent in Michigan, retired nearly 30 years ago really thinking that the agricultural extension effort was over, that the job had been done.

But looking globally, as I do, it's absolutely not true. We're looking at a world which must triple to output of its farms over the next 45 years. And the United States has a unique responsibility for helping to achieve that, both in our role as the traditional leader and current leader in agricultural research and as the owners of the world's largest tract of prime farmland.

The traditional arguments for high yield farming and for extension are still valid—reducing the threat of hunger, reducing food costs—but the new and most urgent importance of agricultural extension and high yield farming results is environmental.

If we do not triple the world's food output by tripling the yields on the existing farmland, then we will do it by plowing down millions of square miles of wildlife habitat around the world. Gentlemen, that is beginning to happen now in places like India, Indonesia, soon perhaps in China, parts of Africa.

And it's not just the number of acres that we protect from being plowed; it's, in fact, protecting the poorest land because it turns out that the poorest land all over the world harbors most of the world's wild species. Something between three-fourths and four-fifths of the world's various wild organisms are in the forests, deserts, glaciers that have not had to be plowed for food to date.

The question of sustainability comes up and the Extension Service is involved in it and it turns out that the high yield agriculture they've helped to foster is the most sustainable we've practiced in 10,000 years. The Achilles' heel of farming has always been soil erosion. When we triple the yield on the best land, we cut soil erosion per ton of food by two-thirds.

Now we're going forward with things like conservation tillage, mulched tillage, precision farming, and these modern high yield farming systems are even more sustainable than they have been in the past. There is far less need, far less incidence of pollution. Particularly I would endorse the committee's interest in precision farming.

But, in addition, these new farming systems are also producing more soil microorganisms, more earthworms, more soil tilth and more organic matter. We have no shortage of organic matter in our high yield farms. Organic farming was more rational 150 years ago when there were low yields and a serious shortage of organic matter.

I'd also say that the opportunity and the responsibility to help meet the growing food gap in Asia is a critical element in rejuvenating the rural communities of this country. The Hudson Institute believes that what we call the web of glass and light—fiber optics, satellite relays, the electronics and telecommunications that are bringing rural America into the mainstream through job decentralization—will be a powerful force in helping our rural communities in the years ahead.

But, in addition to that, in a world which will triple its demand on farm products, half of the additional food should come through exports. Half of those exports, by my estimate, should come from American agriculture.

We know now that the cropland diversion programs, well intended as they were, apparently reduced our rural nonfarm population by one-third. We have the opportunity now, with the help of research, education, extension and free farm trade, to turn that around, to make our rural communities again the agricultural focus and one of the true growth sectors in our economy.

I would close by saying that we must be careful not to divert our agricultural research and extension resources into blind alleys. And here I'm speaking specifically of organic farming and low input, so-called sustainable farming, which, at this point, have not turned up any major success approaches to exploit in this tripling of the world's food production.

We probably now don't have time. We don't have time for a vegetarian trend to appear, which has never appeared. We don't have time now to hope that organic farming is going to increase its yields by threefold. What we have time for is to pursue the high yield approaches that are already paying off. I would urge the committee to keep that in the forefront of their thinking. Thank you.

[The prepared statement of Mr. Avery appears at the conclusion of the hearing.]

Mr. ALLARD. Dr. Weber.

STATEMENT OF GARY WEBER, REPRESENTING THE ANIMAL AGRICULTURE COALITION

Mr. WEBER. Mr. Chairman and members of the subcommittee, thank you for providing the Animal Agriculture Coalition this opportunity to testify regarding the Extension Service.

My name is Gary Weber. I work for the National Cattlemen's Beef Association here in Washington, DC. We are just one member of the Animal Agriculture Coalition and my comments today represent the position of our coalition, which is a broad cross-section of animal agriculture professional organizations. We meet very regularly here in Washington, DC.

I might also add that for over 10 years I worked at the local, State and Federal level of the Cooperative Extension System and enjoyed doing so and it certainly helped prepare me to deal in this area of policy at the Federal level.

Livestock and their products represent over 50 percent of farm and ranch income in the United States. They also represent value-added products which contribute to the vitality of rural communities.

Livestock producers must meet the high expectations of the consumer for safe, wholesome and affordable food. At the same time, in concert with veterinarians and animal scientists, we must address the public's concerns regarding the impact of agricultural production systems on the environment and food safety.

We support Federal Government investments in agricultural research and extension. Previously, investments have produced a more than offsetting return to the taxpayer, in terms of low cost food that's safe and wholesome, as well as increased business activity and resultant vitality of rural communities.

An Economic Research Service comprehensive literature review indicated there have been more than 64 reviews of the investment return for agricultural research and extension conducted from 1915 through 1985. These 64 studies document a conservative average return on this investment of 46.7 percent. Agricultural research and extension continues to be an excellent investment of the public's resources.

Federal investment and partnerships in the agricultural research and extension area are important. We need the Federal partner to provide leadership to ensure these Federal investments are targeted to national priorities regarding food and agriculture from the farm to the table. It is also imperative that there is competent national program leadership provided by the Federal partner in this system.

The following statements represent the views of the Animal Agriculture Coalition regarding the focus of federally funded extension programs.

The public expects farmers and ranchers to produce an abundant supply of affordable, safe and wholesome food. These production systems must be profitable for the farmer and rancher and be globally competitive. At the same time, these production systems must be designed tc protect the natural resource base critical to their sustained productivity.

The Extension system needs to target resources to ensure that farmers and ranchers are able to successfully manage their complex production systems and meet the expectations of the public, as well as their expectations as producers.

This requires the Extension system to target resources to develop applied research and demonstration programs which will help build whole farm and ranch integrated systems. An important component of this requires the Extension system design methods to improve producer access to research-based information, methods and practices, and this access must be tied to decision support systems so the wealth of research-based information available can be successfully reviewed and considered for applicability to each individual farm or ranch integrated system.

We support continued development of the CD-ROM-based databases and decision support systems currently being developed by the system.

The issue of food safety is a high priority for the Animal Agriculture Coalition and the public. Extension must continue to expand programming to ensure all farmers and ranchers have the necessary information and education to prevent violative residues in products or other potential food safety concerns.

The Federal Extension component must employ capable, competent staff to provide the necessary national program leadership, coordination and training to successfully meet the challenges facing animal agriculture. In this regard, it is imperative that Federal Extension staff include a national program leader for Extension animal science, as well as a national program leader for Extension veterinary medicine.

We support the development and activities of the recently mandated single advisory board in the Department of Agriculture. We believe that this board should manage a process to determine priorities for research and extension programs.

Thank you again for this opportunity to discuss our support for Extension programs. We continue to have faith in the design and potential of the Extension system. And through proper priority-setting processes and a focus on the aforementioned priorities, the system can continue to be relevant to animal agriculture and all of society dependent upon the fruits of agriculture. Thank you.

[The prepared statement of Mr. Weber appears at the conclusion of the hearing.]

Mr. ALLARD. Thank you. Mr. Rose.

STATEMENT OF KENNETH ROSE, VICE PRESIDENT FOR RESEARCH AND EDUCATION, NATIONAL GRAIN SORGHUM PRODUCERS

Mr. ROSE. Thank you, Mr. Chairman, members of the committee. I want to thank you today for this opportunity to represent grain sorghum producers on this panel.

I am Kenneth Rose. I grow wheat and sorghum and corn and run cattle on a farm near Keyes, OK. The very nature of agriculture ensures that I must take a certain amount of risk to earn a profit. Research is the most effective tool I have in reducing that risk. It is the means by which I can remain competitive in an ever-changing world.

The oversupply of cereal grains and the low commodity prices of the 1980's gave justification for a tremendous cut-back in research on production agriculture in our land grant universities. It was argued that the main problem was one of surplus production and environmental concerns associated with modern farming practices. Funding for research on the nuts and bolts of corn, wheat, soybean and sorghum production fell dramatically at the State and Federal levels. Many commodity boards followed suit by diverting much of their check-off funding from plant research to research on end use value enhancement and marketing.

Today, in 1996, global food supplies are at all-time lows and commodity prices are at all-time highs. The questions we must now ask are these. What if these events are harbingers of future trends? How fast could we reassemble the talent at our universities and USDA Extension facilities needed to address the nuts and bolts production constraints that will limit our ability to double global food production in the next 20 years while preserving soil and environmental quality? How can our farmers remain competitive in world markets in the next century without a continuous stream of innovation and scientific discovery?

The greatest economic and environmental benefits to our agricultural production system have come from field-based problem-solving research and conventional breeding efforts. Reduced tillage, and the designs of new agriculture equipment, improved nutrient management and the continuous flow of new crop varieties from the seed industry all owe their development to investment in public sector research.

As Dr. Weber just testified indeed, many studies have shown that the rate of return on investment in this kind of agricultural research is typically above 40 percent and is rarely matched in private industry. Specific examples of how research has advanced the sorghum industry include the development of greenbug resistant lines of sorghum germplasm.

The return on investment from this one piece of collaborative research between USDA and U.S. AID has resulted in economic gains of $389 million for the project, representing a 49 percent annual rate of return on the research investment.

Mr. Chairman, please note that these dollar amounts are for the life of the project, and not per year, as shown on your copy.

The development of food quality sorghums which have improved the overall quality of the grain have generated a net benefit of

$180 million in savings to farmers and consumers, at an annual rate of return of 41 percent on the research investment.

The low energy, precision application irrigation technology, called LEPA, is designed to reduce water and energy use. Developed in 1985 by the Texas Agricultural Experiment Station, it is a form of overhead irrigation that applies water much lower to the ground than conventional center pivot systems, reducing water loss through evaporation and wind drift. LEPA systems also reduce energy by applying the water at low pressure. This method helps conserve the dwindling supply of water from the Ogallala Aquifer, benefitting all residents in the area.

The savings to the United States is estimated at $279 million total, with an annual rate of return on the research of 36 percent.

Current USDA research has shown that from northern Kansas through eastern Colorado to the Texas Panhandle, crop rotation strategies can increase dryland yields, can increase dry matter accumulation, water and nutrient efficiencies, crop residues and economic returns while protecting the land from both wind and water erosion.

U.S. sorghum occupies just 9.5 percent of the world area for this crop, yet in the United States we produce 29 percent of the total world sorghum production. However, despite its importance as a major feed grain, sorghum has taken a $500,000 budget cut in research funds over the past 10 years. ARS's own review study shows that sorghum research expenditures have fallen below critical mass while other commodities with considerably fewer acres and dollar values have received $1 million and $2 million increases in research funding, as shown on the accompanying table.

I strongly encourage you to evaluate sorghum research expenditures and redistribute dollars back into sorghum research in accordance with the value, acres and importance of this crop to U.S. agriculture. Thank you, Mr. Chairman.

[The prepared statement of Mr. Rose appears at the conclusion of the hearing.]

Mr. ALLARD. Dr. Donald.

STATEMENT OF SAMUEL L. DONALD, REPRESENTING THE ASSOCIATION OF EXTENSION ADMINISTRATORS OF THE 1890 LAND GRANT COLLEGES AND UNIVERSITIES

Mr. DONALD. Mr. Chairman and other members of the committee, I appreciate the opportunity to participate in this hearing on behalf of the Association of Extension Administrators of the 1890 Land Grant Colleges and Universities. Because I am substituting for another person, I am going to, for the most part, read the prepared statement.

Mr. Chairman, Cooperative Extension Programs are fundamental to the mission of the 1890 Land-Grant Colleges and Universities. The United States Cooperative Extension system is designed to share the benefits of scientific research and promote leadership in individuals, families and communities to improve agricultural production and enhance the quality of life of Americans.

The 1890 Institutions have, over the years, developed special niches for their extension work, as well as broad areas of focus.

One niche common to all of the 1890 Institutions has been the focus on disadvantaged members of our society.

Our clientele, for the most part, are on the lower end of the economic scale. Many have marginal and limited resources. These persons are both rural and urban. They are small farmers and their families and are those pursuing small and home business opportunities.

The development of alternative crops or production strategies offering opportunities for greater profit margins for small operators is another focus of our Extension work.

Among the 1890 Institutions, considerable expertise and experience has been developed over the years in working with small farmers on vegetable, fruit, specialty crops, food animals and aquaculture. A critical component of this work has been education and demonstration programs on production, processing or packaging and marketing. Education programs that impact infant mortality, child and youth development and teen pregnancies, programs that improve health through nutrition education or home environments through practical courses in repairs and management have served our clientele well.

The 1890 Institutions, over the years, have provided leadership and citizenship training in rural areas so that local people are better able to address local issues, including water systems, community and youth education and recreation, crime, health care, and economic development. Conservation and production of natural resources and sustaining environmental quality have also been areas of outreach to small farmers and rural communities.

A lot of this work has required one-on-one interaction by Extension agents and specialists with individuals, families and communities. The 1890's are proud of the service provided over the years to millions of people, those most in need and those often hardest to reach.

We have concentrated a lot of our resources and attention to the youth problems, especially those youth that are in very low income areas. And many of the families that we work with in the 16 States where our Extension are, these young folks are some of the hardest hit in terms of poverty situations. We work with them in many ways of trying to get them through the education system and get them turned in the right direction. We would appreciate any support that we can get in that regard.

We have an after school care program where we work with students who are in the kindergarten through third grades, that they must have failed or read at a grade lower than the grade that they're in in order to quality. Their parents must be from low income families and in many instances they are families that are headed by a single parent.

We have been able to turn the quality of education that they are receiving on a day-to-day basis from being virtually little or no concern on their part to the interest that they have generated, and now they are performing at the level that they should be performing.

We have been able to provide assistance to small farmers and others who were in the process of losing their lands because of the lack of knowledge in terms of management, in terms of marketing of their produce, and so forth, and now these farmers are in the process of buying their land. They're in the process of turning their economic situation around. So we're hopeful that we can continue to get support from the Congress for this.

In closing, the highest priorities for the 1890 Extension Programs are to maintain support for base funding and to maintain funding to enhance extension and research facilities at our institutions. The 1890 Institutions depend primarily on the Congress to meet the needs of our clientele. Therefore, we continue to seek support for Extension-based programs and to enhance facilities at our institutions.

Again, Mr. Chairman and other members of the committee, thank you for the opportunity to appear here today and I will attempt to answer any questions that you may have.

Mr. ALLARD. Thank you, Doctor.

Mr. Urmston.

STATEMENT OF DEAN URMSTON, EXECUTIVE VICE PRESIDENT, AMERICAN SEED TRADE ASSOCIATION

Mr. URMSTON. Good morning Mr. Chairman and members of the subcommittee. I'm Dean Urmston, executive vice president of the American Seed Trade Association. I want to thank you for this opportunity to testify before your subcommittee with a focus on the role of the Federal Government in agricultural research and the direction that we at the American Seed Trade Association believe that it should take as we continue our job of helping American farmers feed our citizens, as well as a growing world.

ASTA, as we are often called, is one of the oldest trade associations in the United States. Throughout our 113-year history we've had the responsibility and privilege of representing and serving the seed industry.

Our motto, "First—the seed," reflects our long-standing commitment to promoting, protecting and advancing agricultural seed interests. Indeed, it is the seed, the foundation of agriculture, that enables American farmers to provide the food and fiber necessary to sustain life and a standard of living envied by many around the world.

As a point of interest, Mr. Chairman, the United States Department of Agriculture calculates current U.S. seed exports at $665 million annually. This can be contrasted with estimates for the U.S. market value at $5 to $6 billion in a world market estimated at around $60 billion.

Obviously seeds are the foundation of agriculture and account for a significant portion of agriculture's contribution to economies here and abroad.

A statistic that came to my attention just after we finished this written report: it is estimated that agricultural exports for 1996 will reach, for the first time, $60 billion, and I might add that most of those agricultural products have their foundation and beginning with seed. But behind that seed is a research effort probably unequaled in our history or the history of the world on both the public and private sides.

To further demonstrate our commitment to support agriculture and our farmers, ASTA also manages two research entities: the

American Seed Research Foundation and the National Council of Commercial Plant Breeders. Both excel in basic research activities and are fully funded by select members of the ASTA. Their ongoing projects reflect our goal of solving tomorrow's problems today.

ASTA's 800-plus member companies know firsthand the importance of research. Our commitment to providing the best genetics to our farmers is the reason why we devote considerable resources, both financial and human, to sophisticated research programs.

Estimates show that annual research expenditures by our private seed companies increased dramatically from about $28 million in 1960 to $470 million in 1994. By comparison, the public sector spent $1.1 billion on all crop research in 1994.

While these expenditures are impressive, Mr. Chairman, we can't do it alone. To continue providing new and improved varieties, varieties that provide the qualities that our farmers have come to know and expect, ASTA believes that a renewed focus should be directed on research programs.

All of us are well aware of tightening budgets and increased competition for dollars. ASTA would respectfully request that as programs are debated and discussed, emphasis be placed on the long-term effects and the benefits to the farmer, as well as the taxpayer. Therefore, it is very important that a strategy be developed that takes into account the demands of the farmer for varieties that offer increased pest and disease resistance and, of course, performance.

Each farmer, regardless of their commodity or geographic location, their first planting decision involves the selection of seed. And that seed selection is based on price, performance, and opportunity for profit.

Mr. Chairman, ASTA believes that there are three components that will lead to an effective and successful research effort. They include cooperation, vision and partnerships. And I'd like to take a moment to briefly offer our thoughts on each.

Cooperation. ASTA believes firmly that because of the strong cooperation between our industry and USDA, academic institutions and land grant colleges, American food and fiber producers are better stewards, more productive and more profitable than ever before. This dominance and success has also sustained a renewed ability to compete in international markets. Our farmers have truly benefitted from information-sharing and joint ventures.

Vision. To sum up the vision of ASTA, I would point to the mounting accomplishments in the area of biotechnology. The products are numerous and the benefits reinforce the responsibility shared by our member companies to provide new products at a fair price with a promise to deliver the best that science and technology has to offer. New varieties that promote good stewardship and strong performance are hallmark qualities that our customers have come to know and depend on.

Under partnerships, ASTA has teamed up with USDA, academic institutions, land grant colleges and others to look ahead to future needs demands and challenges. Oftentimes our crystal ball has pointed us in a direction that provided the guidance we needed. Other times, however, like in the instance of karnal bunt, watermelon fruit blotch and other infestations, the seed industry has sought to form alliances necessary to confront a problem.

Success is dependent on sustained partnerships and thoughtful vision and cooperation.

In conclusion, Mr. Chairman, we all know American agriculture is changing and it is doing so at a pace unprecedented in the history of this country. The varieties of yesterday are obsolete. New varieties must be developed and there will be new challenges ahead for us. There will be new disease infestations, changing farm practices and other environmental concerns.

As an industry, we must remain able to effectively do what we do best as an industry: support the American farmer. Our ability to react and adapt to change will depend on an on-going understanding and redefining of our resources. While our mission will not change, our efforts will be constantly scrutinized and fine-tuned.

Thank you for the opportunity to present this report to the subcommittee.

[The prepared statement of Mr. Urmston appears at the conclusion of the hearing.]

Mr. ALLARD. With that, I thank the panel for all your testimony. I have several questions but I want to start out with this one.

The Department has testified before this committee about how they're working on getting input from the bottom up, that they're making decisions from the top down. And do you feel, many of you as users of the product, that they are accomplishing that goal entirely? Are you entirely comfortable that it is a bottom-up decision, that you're playing a significant role? Are there things that could be done to improve that approach?

Anybody want to take a crack at that question? Do you think it's truly bottom up or are we getting too much from the top down? You're the end users. You're the ones that are using the product. Do you feel like it's meeting what you need in the field to do a good job?

Mr. LUFT. Mr. Chairman, I would be glad to respond. I'm not probably an end user to the extent that some of the producers on the panel are, but as a State partner, I would mention briefly that in terms of priority-setting, as we work it, our counties have advisory committees and they help our county faculty determine what the priorities ought to be for their communities.

In addition, we have a statewide advisory committee that helps us look across all of our programs in teaching, research and in extension, and those committees provide input.

At the State level, we have done town hall meetings where we open it up to folks that come in to provide input into our programs and over the years, as we have done those town hall meetings, it has become very apparent to me that many of the priorities that come from those town hall meetings are very, very similar to the priorities that, in the Extension system, have been established over time at the national level; issues such as water quality, youth at risk, integrated pest management. Those are the things that surface in the communities.

So from my perspective, the system has a great deal of opportunity from the county through the State level to provide input to the Federal partner. And as we work with them in strategic planning and some of the other areas and methods with which we work with them, I think we have considerable opportunity to do that. Our State legislators wish certain things to happen, as do our congressmen and senators at the Federal level.

So I think it's this mix that really makes it effective. And, in some cases, I think there's a tendency to think that there is a considerable amount of top down, but as many of these priorities are developed, information does come through the system and the various committees and approaches that we use to set priorities.

Mr. ALLARD. Anybody else want to answer that question? Yes, sir.

Mr. WEBER. If I may comment on that, I think that the system does a very good job of communicating the priorities to the Federal level. However, there is a challenge in then looking at those priorities and then targeting national program leadership and funds to make sure that, for instance, in the area of food safety, that we have an outstanding program nationwide that does not result in duplication; in other words, with each State doing its own thing, but there would be some national coordination and leadership.

And across all of the issues that are relevant from the Federal perspective, I think that needs to be an element of this. That shouldn't be perceived as top down but rather, it would be leadership as that partner's element of making sure that we're efficient and effective in solving problems of national scope.

Mr. ALLARD. Any other comments before we move on? Yes, sir.

Mr. GUTHRIE. Mr. Chairman, as a user or a participant in Extension ever since I've been a kid in 4-H, I think, and as you indicated in your opening remarks about the charge of Extension, providing practical information and doing it in a forward-thinking manner, I think if we look back now from where we've come to where we are, we've done an admirable job and the Extension Service certainly is something to be commended.

But as we're challenged, as we go forward, especially, as you indicated, with shrinking dollars, how do we build on the successes that we've already had and that we've enjoyed, and especially as we operate within an ever-changing industry, as the agricultural industry is?

But I think that we have lots of innovative people out there doing innovative things, through partnering and forming coalitions with other stakeholders who have a similar concern about the issues, and I think there's room for building a better relationship, and I look forward to it.

Mr. ALLARD. My time has run out on the question side, so I'll now defer to the ranking member of the committee for any questions that he may have.

Mr. JOHNSON. Thank you, Mr. Chairman.

I'd like to say first thanks to Dr. Weber for your efforts to try to bring some sanity and science to bear on the meat safety issue on the Oprah program, among other things. Thank you for that contribution.

Mr. Guthrie, I would be interested in any observations you might have about one, the relationship between what is being termed precision agriculture and sustainable practices, and also any observations you might have about why it is that some people seem to have such an intense antagonism toward sustainable agriculture. If you'd comment on that, I'd appreciate it.

Mr. GUTHRIE. Congressman Johnson, if I could maybe start out at the back end of your question, I do have farmer neighbors who are bothered by the term "sustainable agriculture." In many cases some of these farmers are perhaps doing as much or, in some cases, more than other farmer neighbors towards what I think is building a more sustainable agriculture and agriculture that will sustain itself and sustain a population over time.

Precision agriculture, as it's identified in what I had the brief opportunity to look over some legislation that's being proposed, it's my opinion, and that was a brief overview of that, it has simply almost been taking the term "sustainable agriculture," changed it to "precision agriculture," and went ahead and wrote the rest of the pages.

I do think that sustainable agriculture encompasses a more complex set of issues, which most farming systems are. Precision agriculture, I guess I would view that as being kind of narrow, although certainly it could encompass some of the many components that make up an agricultural system.

But it's my view that any type of agriculture, and as we build agriculture of the future, that we will use many terms and concepts that are generally thought of as sustainable agriculture concepts and incorporate and integrate those into some of the most modern technological advancements. And by doing that and doing that in cooperation and bringing those together, we will build an agriculture that is sustainable and that will sustain society.

Mr. JOHNSON. What kind of yields are you achieving on your operation and those of others using similar management practices and how do they compare to your neighbors?

Mr. GUTHRIE. On my farm, sir, I might not be and am not what some people would term a wholehearted sustainable agriculture farmer. I do practice sustainable practices. My yields are county average yields. On our farms in southwestern Michigan the average corn yield is around 100 bushels to the acre because our soil conditions are different than they are in the thumb of Michigan, which will be more than that.

But my yields are comparable to all my neighbors' yields and I, as well as some of my neighbors, try to incorporate some of the most efficient methods that will promote sustainability.

Mr. JOHNSON. Dr. Luft, based on your experience on the Extension Committee, any brief comments about if it were simply up to you to unilaterally make any changes in the way that Extension Services operate, what would you do differently? Is there anything we should do differently?

Mr. LUFT. Certainly I think any organization, Congressman Johnson, can stand some changes and some improvement. I think we have a need within the system to get more up to date across the system in terms of our electronic and telecommunication capabilities, and I see this as a need.

If I look just at our own State of Idaho, we have some 100 telephone companies in our State. Certain small communities have their own telephone company. It's very difficult in some of our counties for the county agent to have appropriate access even to Internet and World Wide Web. We're getting there but we need to move more quickly.

I think as a system, we don't have a single sort of method or communication technology that we, across the country as a system, have been able to develop. States have developed their own sorts of systems, methods. We have all different kinds of computer configurations, and if somehow we could develop a system where we could communicate, not only amongst ourselves but have access for the producers and users, this would be a tremendous help.

Mr. JOHNSON. My time has about expired and I'd yield the remaining seconds back to the chairman.

Mr. ALLARD. Thank you. Mrs. Chenoweth.

Mrs. CHENOWETH. Thank you, Mr. Chairman.

Dr. Luft, welcome. I'm so glad that you came all the way from Idaho, and this panel has been extremely informative and instructive to me.

Dr. Luft, we're beginning to see more and more certified crop consultants offering their services to farmers around the country. Does the Extension Service provide education and training for private crop consultants?

Mr. LUFT. Representative Chenoweth, yes, we do. We have been very much involved. A number of our county agents, in fact, are also going through the certification process. Although they meet all the educational requirements and, in most cases, exceed them, they are going through that process, as well.

We do a lot of training for the people that are becoming certified consultants. Those that have been consulting for a number of years that probably don't need to go through this certification, we work very closely with them. In southern Idaho, for instance, our Extension specialists, many of whom are located off-campus at the various research and extension centers, hold regular noon luncheons with those people to talk about what problems are you seeing, what research do we have that we can bring to bear on those problems in the community.

We work very closely with them. We provide a lot of the training.

Mrs. CHENOWETH. Well, seeing that consultants charge farmers for this information, are consultants being charged for their training?

Mr. LUFT. Representative Chenoweth, in some cases we do for some of that, to cover basically our operating costs. We don't try to recoup salaries and that sort of thing. We do charge at least a small fee for materials and to help cover the costs.

Mrs. CHENOWETH. Do you think it might be a good idea to make it a practice?

Mr. LUFT. We certainly could do more, yes.

Mrs. CHENOWETH. I was interested in another specific issue relating to Idaho and our High Desert Rangelands. Is our Extension Service there working with our land management agencies on trying to provide a system of better forage, such as substituting the cheet grass for the weeping love grass that's been introduced into New Mexico under the SARE Program? And are you working at all with some of our land management agencies on that to provide better forage?

Mr. **LUFT**. Representative Chenoweth, yes, we do work with them in a number of areas. Probably we have worked more with them in the policy areas, in terms of some of the grazing issues that the producers are very concerned with as they relate to the other agencies. We have done some weed control and other work with other agencies.

I would have to do more checking on that and get back to you specifically.

Mrs. **CHENOWETH**. I'd sure be interested in that, Dr. Luft. I really would. And I hope the cooperation is very good.

With regard to weed control, we're still very concerned about that starthistle up there that's just really taking over our State.

Are the agencies working well with you on the introduction of soil microbes and so forth? How is it going?

Mr. **LUFT**. I think it's going fairly well. Our weed people from the University of Idaho at Moscow are working with the folks on the yellow star thistle problems in Nez Perce and some of the counties just south of there. There is an effort now that we're working very closely with the State Department of Agriculture in terms of developing that so-called center that we'll use biological control and attempt to develop more biological methods.

Mrs. **CHENOWETH**. It's sure a big problem up there, isn't it?

Mr. **LUFT**. It is.

Mrs. **CHENOWETH**. Dr. Luft, I'd like to yield the balance of my time to you. I noticed that you went through your testimony in order to make sure that you confined yourself to the time, but there were several things, as I studied your testimony, that you missed in the essence of time.

In the next minute or minute and a half, I'd like to just ask you to complete your testimony for the record.

Mr. **LUFT**. Thank you, Representative Chenoweth.

I guess one of the key issues, and it relates a little bit to program focus, that I would mention a little more that is, in fact, in my testimony, the ECOP, in conjunction with ESCOP, the Experiment Station Committee on Policy and the Board of Agriculture is working now in a series of listening sessions to develop a set of priorities and to strengthen our programming in both research and extension in the agriculture and natural resource area.

We have conducted listening sessions across the country. We had one session in Washington, DC. We are in the process now of synthesizing and pulling that information together. We will have another meeting to complete that in early October and when that effort is completed, we'd be very glad to provide that information to the committee in terms of what those priorities are that are coming from those listening sessions.

And those sessions have been designed to bring outside people, not people from our own system but to bring the producers and users together to help us in a priority-setting process. And our Federal partner has been involved in these, as well, and that information will be used, as a system, with our Federal partner and the various States that are involved.

I guess that is the other key point that I would make. Thank you.

Mr. ALLARD. Thank you. I now recognize the gentleman from Michigan, Mr. Smith.

Mr. SMITH. I would like to give any time I have left to Dennis Avery, but I won't have any time left.

I guess some of my concerns are research and its application to increased profits, farm profits in this country, as opposed to maybe less selfish research that benefits sometimes other parts of the world more than it does us in this country.

And also maybe if I could get your reaction to my impression that new research, whether it's seed varieties or anything else, tends to be short-lived in terms of its effect on the profitability for farmers and ranchers. In other words, my experience is that the quicker we get our hands on that research to increase production, the greater our profits before everybody else starts doing it and the production is increased or other countries start increasing their production and we go back to the same level of profitability.

My third area if anybody would like to comment on is in this, I think, mixed definition that we have for sustainable agriculture that started out defining organic farming and has evolved away from that, as far as I'm concerned, into being able to survive in agriculture and continue to produce and continue to make a profit.

Do panel members think that there is a misrepresentation of sustainable agriculture? What does sustainable agriculture mean to anybody on the panel? Is there anybody on the panel that thinks that sustainable agriculture and organic farming are the same approach? Do we have a problem with the words? Dennis?

Mr. AVERY. I definitely think there is a problem. And of course, all agriculture has sought to be sustainable from the beginning. We're just getting closer now than we ever have before. And I don't know anybody who's billing their agriculture as unsustainable.

And what I was really addressing this morning is not unsustainable or sustainable agriculture but the difference between high and low yield agriculture. And there has been, maybe not on this committee but certainly amongst the general public in this country, a very deep concern, some of it fanned by activists but a very deep concern about the safety and sustainability of what I call high yield farming.

And I am very much afraid that we are losing agricultural research and extension capability that could help save huge tracts of world wildlife, losing it to a myth that low yield farming is a, more sustainable and b, better for the environment.

I spoke yesterday with a guy from the U.N. environmental program in Kansas City who said, "I'm a forester." He said, "I've been out there in the world. I've seen 700 million acres of forest sacrificed to low yield traditional farming and the public thinks that is the way we ought to go." He says it's a disaster.

Mr. SMITH. Let me throw out another question. Can we be more, for lack of a nicer word, can we be more selfish in directing our agricultural research so that the greatest benefit and the most likely benefit is going to be to the United States of America and that somehow we put criteria in our research that takes into consideration our infrastructure, our climate, our whatever, so that the greater advantage is going to be in this country both in increasing farm production and therefore profitability and therefore helping feed whoever? Mr. Rose?

Mr. **ROSE**. Congressman, I have a research background, and about 15 years ago I went into agriculture and farming full time. One of the things I noticed right away was the slow acceptance or slow evolution learning process of conveying the research that's done at universities to the farm/farmer level. That technology is very often slow to catch on.

I think the Extension Service is the key here. That is probably the one source that farmers trust and believe in and get their information from. That process needs to speed up. We need to be aware of processes, techniques and seed that is available at the university level or in research quicker, because that stuff becomes publicly known pretty quick and distributed worldwide. I think that is one way to address what you're asking.

Mr. **SMITH**. Go ahead.

Mr. **GUTHRIE**. Congressman Smith, I would just like to echo the comments that he just made but I think that we do have in place right now the SARE Program that I referred to and some of the things that it does that addresses that situation.

I do think that we, as farmers, maybe cannot wait as long for the traditional route of research and education to get to us as we need to compete in an agricultural industry that must be profitable for us and to get the kind of production that we need. But I think by teaming up and partnering some of the research and extension people together, along with farmers, that we can enhance that effort and make improvements on it.

Mr. **SMITH**. My question would relate to the problem that we're overspending and we continue to increase the debt of this country and that's bad for the economy and it's bad for our kids and our grandkids. So I want to ask you the question about throwing some of the research funding load onto producers/processors, which is ultimately the consumer.

It seems to me that if the profit was high enough, that we're going to stimulate production in research. I mean, there's going to be that drive for an industry and the agriculture business, like any other business, is going to look for ways to increase their production if the result of that production has a reasonable profit.

If we were to say to farmers, "Look, if prices get this high, then how about a check-off that goes into research," how do we move some of these research dollars to the private sector, not only to the processors and the distributors but to the producers? Or shall we keep taxing the consumers through general funding through the Federal programs? Dennis?

Mr. **AVERY**. Mr. Smith, I understand the motivation and I think it's a worthy one but truly, the public has a responsibility for pursuing agricultural research because, as you've noted, the benefits from the research don't stay with the farmer. The competition quickly dissipates that and we're back to having lower food costs and less hunger.

And this research is truly figuring out how to save the world's wildlife. I'm not in favor of making the farmer pay for that. The benefits of agricultural research are fundamentally not to the farmer.

Mr. SMITH. I think that's an excellent point. I actually made a note of that because I think that's what we've got to start stressing also. It seems to me that a greater public need is the need to support and help finance basic research rather than in applied research that has a more direct relationship to the profitability of the distributors or the processors or the producers.

Any comment on that from any member?

Mr. URMSTON. I have one comment, Mr. Smith. We wouldn't have time today to list all of the check-off programs where producers already contribute dollars to research. I think the commodity prices should get to a certain level. I think we ought to get them to that level first before we start taking it away from them.

To me, and ASTA is on record of the Government having a balanced budget, and we're all in favor of that. That means less dollars going out. I think this subcommittee, in the area of research, needs to give some kind of a written statement or policy, on the types of research projects with these dollars.

I'm very much a supporter of land grant universities, but we're starting to see them produce varieties of crops that are already overproduced by the private sector. Why are they spending dollars producing alfalfa varieties, for example, when they should be spending those dollars on some of the more exotic things that private industry, where they need to get a return on their investment, can't justify? And they will, in the long run, be of benefit to the American farmer.

I'd like to see that kind of direction given to the dollars that are released for spending in research.

Mr. SMITH. Mr. Chairman, in closing, maybe in the way of an apology, but both sides of the aisle are very involved and there's a limited attendance this morning because we've been having conferences on the welfare reform bill as well as trying to decide the structure of the rest of the appropriation bills that we're going to try to pass before we recess in August.

So I wish more individuals from this committee could have been here to hear your testimony but I, for one, thank you very much.

Mr. ALLARD. I want to thank the panel. You've done a nice job for us.

The chair would ask unanimous consent to allow the record of today's hearing to remain open for 10 days to receive additional material and supplementary written responses from witnesses to any question posed by a member of the panel. Without objection, it's so ordered.

Mr. SMITH. And could I put a statement in the record, with your permission?

Mr. ALLARD. Without objection, so ordered.

This hearing of the Resource Conservation, Research, and Forestry Subcommittee is now adjourned. Thank you.

[Whereupon, at 11:31 a.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

STATEMENT OF DR. CATHERINE E. WOTEKI, ACTING UNDER SECRETARY, RESEARCH, EDUCATION, AND ECONOMICS, U.S. DEPARTMENT OF AGRICULTURE

Mr. Chairman and members of the Subcommittee, I am Dr. Catherine E. Woteki, Acting Under Secretary for Research, Education, and Economics at the Department of Agriculture. Thank you for the opportunity to discuss with you extension programs and information dissemination activities of the Department of Agriculture. Accompanying me is Dr. Bob Robinson, Administrator of the Cooperative State Research, Education, and Extension Service (CSREES). Dr. Robinson's testimony will focus primarily on extension programs and CSREES' use of information systems to aid in technology transfer. Before he presents his testimony, I would like to highlight briefly for the subcommittee the contributions of the other three agencies within the Research, Education, and Economics (REE) mission area in the areas of information management and dissemination: the Agricultural Research Service (ARS), the Economic Research Service (ERS), and the National Agricultural Statistics Service (NASS). Dr. Floyd Horn, the Administrator of ARS, Dr. Susan Offutt, the Administrator of ERS, and Mr. Don Bay, the Administrator of NASS, are all here today to answer any questions you might have.

At the hearing in May, Mr. Chairman, we emphasized that the passage of the Federal Agriculture Improvement and Reform (FAIR) Act of 1996 with its increased reliance on markets makes research in support of the American food and agricultural system more important than ever. We continue to believe that our investments—Federal, State, and private—in research, education, and economics are central to enabling farmers to compete in domestic and international markets. American producers will need access to new technology as well as timely information to compete in these global markets. They will also need better risk management tools to help them withstand price swings. The biophysical and economic research and statistical collection activities of USDA can make major contributions to securing America's future by providing the scientific basis for new technology and by providing access to information and risk management tools needed in this new environment. At the same time, REE programs address a broader set of issues—consumer health and food safety, environmental protection, rural quality of life—on which consumers, producers, and taxpayers expect information.

Mr. Chairman, today our discussion will focus on the dissemination of results—of biophysical and economic research and of statistical collection activities—through a variety of mechanisms. On one end of the spectrum, extension programs provide person-to-person communication and non-formal education. On the other end, consistent with advances in information technologies, REE agencies and extension personnel provide access to agricultural information to an even broader audience via the Internet. Mr. Chairman, you, your colleagues, and staff are invited later today to see demonstrations of the information systems technology we will describe today. We encourage all of you to attend and see our information delivery systems in action.

While there are any number of ways to look at REE's role in information management and dissemination, Dr. Robinson and I have organized our remarks around three groups of benefactors of our REE activities: private producers and consumers; public policy and program officials; and scientists, educators, and other professionals. These three user groups benefit from very different types of information ranging from basic technical data to economic trends to comprehensive information systems. All such programs depend on a sound research base.

Information Systems for Producers and Consumers

One of the most compelling reasons for federal support of agricultural research is its potential to help individuals make decisions affecting their livelihood, their health, and their families. The private sector has little incentive to address many of these important questions. Rapid advances in communications technology and distance education offer public institutions tremendous opportunities to increase effectiveness in the use of program funds and to share expertise to meet customer's needs. For example, on-line access to research information from REE agencies is available using the CSREES, ARS, ERS and NASS Home Pages. ERS, NASS, and the World Agricultural Outlook Board in USDA's Chief Economist's office, in collaboration with Cornell University's Mann Library, provide Internet access to more than 500 USDA reports each year as well as to thousands of data files covering all aspects of domestic and international agriculture, agricultural economics, and rural affairs. Crop and livestock estimates, situation and outlook information, and world supply and demand estimates are included. This system also offers an e-mail subscription service that automatically sends users electronic copies of reports within minutes of release. As another example, ERS and NASS maintain key indicators of the agricultural economy—such as net farm income and commodity prices—in the Federal Statistics Briefing Room on the White House home page. As one of the reinvention labs under the Reinventing Government Initiative, CSREES provides access to such resources as USDA emergency programs, health care reform, new school lunch regulations, NAFTA and GATT documents, and daily White House Press office public documents and summaries.

Information Systems for Managers and Policy Makers

Agricultural markets work best when all participants have equal access to sound economic information. NASS and ERS provide statistical data on and analysis of current situation and outlook conditions, economic conditions, market prospects, chemical uses, land uses, environmental conditions, farm income and financial conditions, and food consumption and expenditures. These agricultural data are used to monitor the ever-changing domestic and international agricultural sectors and formulate and implement agricultural policy, farm program legislation, commodity programs, agricultural research, rural development initiatives and related activities. Additionally, all this information contributes to an orderly development of production and marketing decisions by farmers, ranchers, and other agribusinesses.

Earlier this year, the President's budget proposed to transfer the responsibility for the Census of Agriculture from the Bureau of Census in the Department of Commerce to NASS in the Department of Agriculture. The merger of these two similar Federal programs should make it possible to capture future savings by consolidating two agricultural statistics programs, to better serve the public with timely and accurate agricultural information, to further complement USDA research programs, as well as to strengthen the development of public policy for rural areas. We appreciate very much, Mr. Chairman, the work of the full House Agriculture Committee earlier this month to mark up and report to the House a bill, H.R. 3665, to transfer these authorities to NASS at the Department of Agriculture. We are hopeful the bill will be included on the suspension calendar very soon.

Information Systems for Scientists and Professional Educators

I would like to focus your attention now on information systems that we make available specifically for the professional research and education communities. In addition to the Current Research Information System, about which Dr. Robinson will testify, our scientists and educators rely on a number of systems to support and further their work. One of these is the ARS Germplasm Resources Information Network (GRIN) which is the National Plant Germplasm System's computer database. It contains information on all genetic resources preserved by the National Plant Germplasm System. Through GRIN, scientists learn about the characteristics and location of specific germplasm. ARS maintains the GRIN database at its research center in Beltsville, Maryland, for scientists and other users cooperating in the national system.

Our National Agricultural Library (NAL) which is a component of ARS in Beltsville, Maryland, is the largest repository of agriculture related materials in the world. To enhance dissemination of information, the NAL has ten on-site "information centers." For example, the Agricultural Trade and Marketing Information Center (ATMIC) collects, maintains, and disseminates information on many aspects of agricultural trade and marketing, and on commodity futures trading. The Food and Nutrition Information Center (FNIC) provides electronic and traditional access to all areas of food and human nutrition information for consumers, health professionals, scientists and researchers. The Rural Information Center (RIC) is a joint project of the National Agricultural Library and the Cooperative Extension Service (CES). RIC provides information and referral services to local government officials, community organizations, health professionals and organizations, cooperatives, libraries, businesses, and rural citizens working to maintain the vitality of America's rural areas. The Center combines the technical, subject-matter expertise resources of CES's nationwide educational network with the information specialists and resources of NAL. Other information centers at NAL focus on animal welfare, aquaculture, biotechnology, plant genome, alternative farming systems, technology transfer, and water quality.

AGRICOLA (AGRICultural On-Line Access) is a bibliographic database produced by the NAL containing over three million citations to the worldwide literature on all aspects of agriculture plus other related topics, such as pollution, weather/climate, and energy. The literature cited is primarily in English, but over one-third of the database comprises citations to rare foreign language publications. The Library also serves as the home site for two collaborative information systems that involve USDA agencies, universities, and other organizations. One system is the Agricultural Genome Information System (AGIS), which provides access to genome in-

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formation on agriculturally important organisms. The other is the Agriculture Network Information Center (AgNIC), which provides access to worldwide agriculture-related information resources on the Internet.

USDA's Research, Education, and Economics agencies in association with their university partners are in strong agreement on the need for a new data system applicable to the entire USDA mission area and are strategically positioned to develop a comprehensive system. We appreciate the fact that Congress addressed two separate needs in Section 804 of the recently enacted Farm Bill: 1) review of state-of-the-art systems to prepare to update the existing Current Research Information System (CRIS); and 2) development of a monitoring and evaluation system for agricultural research and extension activities with information transfer technologies that optimize public access consistent with requirements of the Government Performance and Results Act of 1993. Dr. Robinson will discuss our plans for implementation. Throughout the complex process of designing, testing, and implementing such a system, we will be seeking your counsel.

Mr. Chairman, by strengthening our commitment to agricultural research, education and economics, we can ensure that we will continue to enjoy a competitive farm sector, a strong rural economy, abundant natural resources, and a healthy, well-nourished population.

For more than a century, the Federal Government has played a major role in supporting agricultural research, helping to transform U.S. agriculture from a resource-based industry to a science-based industry. Since World War II, agricultural production in the United States has more than doubled, even though total resources used in production have actually declined. In other words, virtually all growth in agricultural production has come from applying new technologies with greater efficiency, rather than from expanding the resource base. This has been in large part a result of our investment in agricultural research, education, and economics. This investment has enabled a steady flow of improved technology to become available and quickly diffused to American farmers.

Thank you for the opportunity to discuss the importance of dissemination of research results. My colleagues and I are happy to answer any questions you may have.

STATEMENT OF DR. B. H. ROBINSON, ADMINISTRATOR, COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

Mr. Chairman and Members of the Subcommittee, I am Dr. Bob Robinson, Administrator of the Cooperative State Research, Education, and Extension Service (CSREES). I am pleased to be with you today to discuss agricultural extension, CSREES' activities in information management, and dissemination needs ranging from those of agricultural producers to those of consumers who are concerned about food safety and quality, diet and health.

As Dr. Woteki indicated, we envision the Research, Education, and Economics mission area as being the catalyst and premier provider of knowledge to promote the well-being of U.S. consumers, agricultural producers and processors, and rural residents. We firmly believe that the Federal role in information management and dissemination extends beyond what is a reasonable expectation of the private sector and is fundamental to fully-informed participation in the U.S. and world economies in a systematic and equitable way by all sectors of the population. In this context, information management and dissemination are key REE functions and are often carried out through the Cooperative Extension System (CES) nonformal education programs. As a result, the generation, management and dissemination of high-quality information are primary objectives of our policy makers and program leaders.

The goal of Cooperative State Research, Education, and Extension programs at USDA is to sustain a viable food and agricultural system that: 1) enhances economic opportunities and reduces risks for producers and consumers; 2) competes aggressively in a global economy; 3) affords a safe and secure food and fiber supply for all Americans; and 4) maintains a quality environment. As you and your colleagues have stated on many occasions, these four goals underlie our national security and our quality of life. CES's efforts to enable people to improve their lives and communities through learning partnerships that put knowledge to work are central to the achievement of these goals.

CES promotes partnerships with and among people in their local settings and provides them access to research-based knowledge of a practical nature that they can use to address issues, solve problems, and make changes, in other words, to enable them to help themselves.

Extension is a publicly funded, lifelong educational system that links the education and research resources and activities of more than 100 land-grant institutions (including the 29 Tribal Colleges), 3,150 counties, and the United States Department of Agriculture. Extension programs are carried out by approximately 32,000 employees and 2.8 million volunteers. This system is authorized by the Smith-Lever Act of 1914, the National Research, Extension and Teaching Policy Act of 1977, as amended, P.L. 103-382, and companion legislation in each state and territory. CES is funded jointly by Federal, state/territory, and local government monies, with the majority (over 70%) provided by the two nonfederal partners.

Extension base programs are the major educational efforts that comprise the core mission of the CES and are common to most Extension units. They are dynamic, results-oriented educational activities that receive significant resources throughout CES on the national, state, and local levels. Each base program focuses on a single subject-matter but encompasses multiple disciplines. The current base programs are:

- Agriculture
- Natural Resources and Environmental Management
- Nutrition, Diet and Health
- Community Resources and Economic Development
- 4-H and Youth Development
- Family Development and Resource Management
- Leadership and Volunteer Development

If one compares the base programs to the foundation of a building, CES's national initiatives rise from that foundation to receive special emphasis for a specific period of time. As issues develop that warrant national attention, USDA and CES jointly select initiatives relevant to the Extension mission. Carrying out the initiatives requires considerable input by the base programs, particularly subject-matter and discipline expertise. National initiatives are supported by the base programs, exist for a relatively short period of time, and are subsequently incorporated into the base programs. The current national initiatives are:

- Children, Youth and Families at Risk
- Managing Change in Agriculture
- Food Safety and Quality
- Communities in Economic Transition
- Water Quality
- Sustainable Agriculture
- Decisions for Health

While traditionally Cooperative Extension personnel have engaged in one-on-one education efforts, increasingly their role is to function as organizers, facilitators, information brokers and networkers rather than direct transferrers of information. This new functional emphasis is encouraged in the March 6, 1996, Congressional Research Service Report to the Congress on "Agricultural Research, Education, and Extension" and in a recently released REE Working Group Report, "Charting the Course for the Cooperative Extension System Federal Agenda." CSREES welcomes your guidance and advice as it works with the State Cooperative Extension System to make program adjustments in response to the needs of a changing clientele.

All effective education programs depend on sound research results. In 1994, as part of the reorganization of USDA, Congress merged the former Cooperative State Research Service with the former Extension Service into one agency, the Cooperative State Research, Education, and Extension Service (CSREES). Our new agency has created even stronger linkages between research and education. Here is just one example of the benefits of this link. In 1994, CSREES devised a new staffing model by locating an extension educator on- site at the ARS Children's Nutrition Research Center (CNRC) associated with the Baylor College of Medicine in Houston, Texas. This extension educator is now positioned to facilitate rapid transmission of research results in the areas of maternal and child health to educators all around the country. As a result, teaching and training programs at the local level can better reflect the most current and accurate knowledge generated by USDA's research programs. In addition, we are using an electronic newsletter to disseminate research information from the CNRC with very positive results. Within hours of the newsletter having been sent to all States, it is further transmitted to every county home economist within the State. As a result, timely and useful information is disseminated very quickly to the professionals who are working to meet the needs of their local communities. We believe that this model merits consideration for other extension programs.

Following the outline provided by Dr. Woteki, I want to briefly highlight CSREES' role in information management and dissemination for the benefit of: private producers and consumers; public policy and program officials; and scientists, educators, and other professionals. Our information systems provide another avenue to disseminate information and research results.

INFORMATION SYSTEMS FOR PRODUCERS AND CONSUMERS

We offer a remarkable array of education programs and decision-making aids for such audiences as farmers, ranchers, nursery operators, timber growers, community leaders, family members, and individual consumers. Through Agricultural Databases for Decision Support (ADDS) developed by extension personnel at USDA and several land grant universities, we offer electronic access to collections of related educational materials, lists, and software tools. Available on CD-ROM discs, and in some instances Internet and the World Wide Web, ADDS provides information, education and support for decision-making by farmers, ranchers, growers and other agricultural producers to increase profits; encourage the production of high quality and safe food, fiber, or fuel; make the best use of available resources; protect the environment; and support the infrastructure of rural communities.

Another notable example of a decision aid to help farmers is FARM*A*SYST, which is used to assess farms and farmsteads for potential pollution problems. Private landowners have completed more than 22,000 assessments with FARM*A*SYST, and, as a result, have invested more than $15 million in pollution prevention practices. The FARM*A*SYST Program is a partnership venture by CSREES, USDA's Natural Resources Conservation Service, the Environmental Protection Agency (EPA), and the Wisconsin and Minnesota Cooperative Extension Services. It also entails partnerships encompassing State governments, farm organizations, and private businesses. Along with EPA, we are working also with Argonne National Laboratory to develop a decision support system applicable to integrated pest management. Another useful decision aid for producers is PLANETOR, a software system developed at the University of Minnesota for computing monetary returns, monetary risks, and environmental risks of a farm. Still another example of decision-making systems is FINPACK, a financial planning and analysis system.

In cooperation with Washington State University and volunteers from Americans Communicating Electronically, CSREES is providing technical assistance to enable Indian Reservation Extension Program sites and the 29 Tribal Colleges to connect to Internet. Ultimately, we envision that the remote sites for the Indian Reservation Extension Program will be able to electronically access technical support, educational materials, and programming.

INFORMATION SYSTEMS FOR MANAGERS AND POLICY MAKERS

More and more we have come to realize that effective programs cross administrative lines and involve collaborative work by many agencies, organizations, and citizens. To stimulate collaboration among universities and community-based programs, in 1994, the CES created four National Networks to marshal faculty and program resources to respond directly to the economic, social, and human stresses faced by children, youth, and families. In 1996, a fifth National Network was added. Each Network is a collaboration of faculty in appropriate departments from multiple land-grant universities. These five Networks, linked electronically, constitute the Children, Youth, and Family Education and Research NETWORK (CYFERNET), which provides state, county, and community program staff and volunteers with access to training, curriculum, consultation, and research information.

Our most widely recognized information system for managerial and administrative purposes is the Current Research Information System (CRIS). CRIS is USDA's computer-based documentation and reporting system for ongoing agricultural, food and nutrition, and forestry research. CRIS was originally designed to provide scientists ready access to research conducted primarily within the USDA/State agricultural research system. It was intended to help plan research, avoid costly duplication, identify changing areas of emphasis, and to establish functional contacts across the science community. CRIS was not originally designed for daily management purposes or to directly service farmers, ranchers, gardeners, retailers of farm equipment, or the non-scientific public. Even so, CRIS has often proven useful to these individuals as a source of contact names for help on specific issues.

We are well aware that CRIS today is constrained by outdated technologies, a traditional classification system, and limited ability to provide data on broad program areas as opposed to only project data. We are pleased to inform you about a major CRIS enhancement initiative we have underway. By expanding both the content and technical capabilities of CRIS, we anticipate it will serve as a bridge to a more comprehensive information system to monitor and evaluate research and extension activities within our mission area. That more comprehensive system was authorized by Section 804 of the Federal Agriculture Improvement and Reform Act of 1996.

In order to make CRIS data more useful, more accessible to users, and to conserve fiscal resources, we have purchased a new UNIX Operating System and Star Software which will result in easier access to CRIS data via the World Wide Web. We are working also to improve the breadth and the flexibility of the CRIS classification system so that it better reflects new and emerging areas of science. In order to comply with the new requirements of the Government Performance and Results Act (GPRA), we are assessing ways to develop an accountability and accomplishments reporting process to incorporate into CRIS as you have further directed us in Section 804 of FAIR 96. These are complex and costly initiatives. Our progress will depend largely on our ability to marshal resources and leadership for such purposes.

INFORMATION SYSTEMS FOR SCIENTISTS AND PROFESSIONAL EDUCATORS

While Dr. Woteki discussed a number of information systems available specifically for the professional research and education communities, there is also the higher education teaching system which has its own unique needs. Comprehensive information on the attributes of our U.S. agricultural education system is vital if we are to have the capacity to predict enrollment trends, identify potential shortages and surpluses of graduates, and create programs to sustain and advance a diverse educational system. Without a national database, academic administrators cannot plan and evaluate use of faculty and other educational resources; nor can they assess the availability of and demand for graduates available for employment across the full spectrum of the U.S. labor force. At USDA, we require national baseline data to identify areas for investment in educational programs aimed at ensuring the U.S. of an adequate supply of food and agriculture scientists and professionals.

We have developed the Food and Agricultural Education Information System (FAEIS), which is a unique national database on higher education in the food and agricultural sciences. FAEIS offers a broad range of higher education statistics related to agriculture, forestry, renewable natural resources, family and consumer sciences and veterinary medicine. By integrating national USDA data from a variety of sources—the National Science Foundation, the Department of Education, the Department of Labor, and numerous professional associations—FAEIS provides ready access to essential empirical information for planning and coordinating initiatives to strengthen higher education curricula, faculty, enrollments, etc., in the food and agricultural sciences.

Mr. Chairman, you and members of the Subcommittee are already aware that USDA's Research, Education, and Economics mission area agencies and their university partners presently lack a central, integrated, user-friendly electronic information system capable of providing an all inclusive knowledge base on our programs. An information system of this kind is what Congress authorized in Section 804 of the FAIR 96 Act, and would enable the Department and its partners to readily conduct comprehensive baseline and ongoing assessments as well as evaluations of research, education, extension and economics programs and projects. This authorization is timely for several reasons. One, the U.S. continues to need a visionary, publicly funded research and development (R&D) program to produce essential knowledge and innovations to meet the demands of the global market. Two, a comprehensive information system is needed to serve as a primary reference source for development of new research and education projects on such diverse issues as increasing productivity in agriculture and processing, improving the safety and quality of food, and enhancing the sustainability of the environment and rural communities. Three, Federal/State policy makers and administrators need to be able to account for historical, current, and future use of public funds and to provide a basis for redirecting funds to higher priority problems. Four, compliance with the Government Performance and Results Act will require reporting of new kinds of information not currently captured by our existing decentralized information systems.

Mr. Chairman, we appreciate the fact that Congress addressed the need for such a system in the recently enacted Farm Bill and that it gave USDA statutory direction to assist in meeting these needs. Important groundwork for this system has already been conducted. In 1993, CSREES entered a cooperative agreement with the Pennsylvania State University to conduct a review of the information needs of national decision-makers regarding both research and extension programs of USDA and state cooperators. This study will be used as one frame of reference for planning and designing the proposed evaluation and monitoring system for Research, Education, and Economics. A second study in 1993, conducted by Colorado State University, identified a broad spectrum of recommendations and options for improving the effectiveness of CRIS. This study will likewise serve as an excellent reference to guide initial decision-making.

Mr. Chairman, the President's budget requested $500,000 for a new information system for REE. The House Appropriations Committee allocated $400,000 and the Senate Appropriations Committee also allocated $400,000. We appreciate Congress' interest in and support for this funding in the appropriations process. The proposed funding will enable us to engage an experienced and successful private contractor—as Congress directed in the conference report for FAIR 96 —that specializes in public sector information systems.

CONCLUSION

The astounding success of 20th century American agriculture has been due largely to access to a continually and rapidly expanding knowledge base. In order to help our customers access the very latest information, extension agents are relying more and more on new technologies, including computerized decision support aids. Extension personnel are also working to help individuals locate additional organizations/experts that can enhance their ability to achieve economic security and a desired quality of life.

Mr. Chairman and members of the Subcommittee, thank you for the opportunity to testify. I would be happy to answer any questions.

Testimony Presented to
House Agriculture Subcommittee
on Resource Conservation, Research and Forestry
The Honorable Wayne Allard, Chair

by

LeRoy D. Luft, Director
Cooperative Extension System, University of Idaho
and Chair
Extension Committee on Organization and Policy

Thank you, Mr. Chairman, for the opportunity to offer recommendations for your consideration in the review of the Federal Agriculture Improvement and Reform (FAIR) Act of 1996 and specifically the Research, Extension and Education Title. My name is LeRoy Luft, Extension Director, University of Idaho, and Chair of the Extension Committee on Organization and Policy (ECOP), which is the policy board of directors for the state Cooperative Extension Services.

ECOP was one of several organizations invited to respond to the survey about research, education and extension that was previously conducted by your committee. We appreciated the opportunity to respond and did so with a broad base of input from the leadership in the Extension System across the country. Thus, I will not dwell on those topics covered by the survey because we attempted to provide your committee with a concise, but complete, response to each question. My testimony will complement and supplement our earlier responses to those questions.

ECOP is also a key link from the various state extension services to our federal partner, the Cooperative State Research, Education and Extension Service (CSREES). ECOP, as a board, links to and works with the federal partner on issues of strategic planning, priority setting, as well as organizational and policy issues.

Congressional Authorization

The Cooperative Extension Services, established in each state and the several territories, under the enabling legislation of the Smith-Lever Act of 1914, is a publicly funded, lifelong educational system that links education and research based knowledge with the expressed needs of people. A portion of its purpose, as set forth in this legislation, is ". . . to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage application of the same . . ." This purpose has been modified in the legislation over time, but the basic focus and intent remains. Our current mission statement is: ". . . to enable people to improve their lives and communities through learning partnerships that put knowledge to work."

Helping people put research knowledge to work through Extension education and information programs has had a positive impact on both producers and consumers. For example, the average U.S. consumer pays only eight percent of annual income for at-home food costs. This is less than in any other developed country. Our nation's producers of food provide a very safe and reliable food supply while providing one of the largest offsets for our foreign trade deficit. Research and Extension education are an important aspect of achieving these accomplishments.

The Cooperative Extension System carries out this life-long educational mission through a network that links the resources of 74 land-grant institutions in the 50 states and territories, over 3000 counties and the Department of Agriculture. The CSREES, as our federal partner, provides national coordination and linkages throughout the system. We work together, as indicated earlier, to fulfill our primary purpose, which is to provide educational programs and information that focus on the needs of people as they deal with everyday business, family and community issues. Collaboration with a multitude of national, state and local, public and private organizations is becoming an increasingly common mode of operation as we address the ofttimes complex issues of the various Cooperative Extension constituents. This entire educational effort is supported by nearly three million volunteer leaders who are a major resource in helping meet the ever increasing demands we are encountering for education and information.

Federal Funding Mechanisms

In this time of debate about federal fiscal policy, perhaps it is important to remember that the Cooperative Extension Services have been and continue to be funded under a rather unique set of funding mechanisms. The Smith-Lever 3(b) and 3(c) funds are allocated to the states on a formula basis, with rather broad parameters about allowable use. The Smith-Lever 3(d) and other funding authorizations are targeted much more specifically in terms of purpose than the 3(b) and 3(c) authorization language. Programs funded under the 3(d) and other non 3(b) and 3(c) authorizations are primarily allocated to the states on a competitive basis or a formula basis unique to each line item. These two types of fund allocation serve the purposes of the Extension System very well because one complements the other. The 3(b) and 3(c) funds provide critical support for maintaining the core scientific staff that are essential to support our base programs, emergency response programs, and the targeted programs, such as the 3(d) funded programs.

The other two major sources of funding for the state Cooperative Extension Services, in addition to the Congress, are the state legislative assemblies and the county and city governments. State funding is often a combination of block funding along with some targeted line item funds. County and city funding are generally not program specific. This tri-partite approach to funding has helped assure an opportunity for input to program priorities and focus to assure that each level of government has its appropriate role in determining the state Cooperative Extension Services programs. This tri-partite funding also leverages about four dollars of state and local funding for each one dollar of federally appropriated funds. These federal appropriations are increasingly a part of leveraging private funds, which are approaching ten percent of the average state Extension Service annual budgets.

Therefore, we highly recommend and encourage that the federal funding policy mechanism for the State Cooperative Extension Services not be changed. It has stood the test of time for 80 plus years and is still relevant today! Many agencies and organizations are looking at the federal/state/local funding partnerships used by Extension as an ideal model for collaborative projects, including such federally funded program areas as health care, human nutrition and feeding programs. While there has been discussion within the Cooperative Extension System and in the Congress about changing the Smith-Lever 3(c) formula over that past 20 years or so, the decision has been to leave the formula as is. We concur with these decisions.

Allocation of Funds

During the past several years you may have heard, as we have, that the Cooperative Extension Service has moved away from serving agriculture and has shifted resources to other types of programs. No matter how we have analyzed the resource allocation data from throughout the state Cooperative Extension Services, just the opposite trend is found. For example, the state Cooperative Extension Services allocated 38 percent of their total resources to agriculture and natural resource programs in 1973; increasing to 44 percent in 1983; and 47 percent in 1993. Resource allocation reductions occurred in youth and community development programs. Agriculture and natural resource issues and needs are still the bread and butter programs of the Cooperative Extension Services.

Future Program Focus

The worldwide movement towards a more market driven agriculture, with less government influence on production and marketing decisions, intensifies the need for and importance of a readily available and reliable knowledge base. Thus, the need for maintaining a viable research and extension system is central to assuring that the agriculture sector of our nation has a dependable source of information for making decisions from production to marketing. Risk management will be an ever increasing critical factor in the operation of a successful agriculture production business.

The Cooperative Extension Service, at the grass roots level, has considerable experience and expertise in determining producers needs for use in establishing program priorities. In an effort to better utilize this expertise than we have in the past, we are committed to more active involvement with our agriculture research colleagues in facilitating grass roots input for the research agenda. Consistent with this commitment, and in concert with the Agricultural Experiment Station leadership, we are currently conducting a series of nationwide meetings on what the future research and education agenda priorities should be for agriculture and natural resources. This will be completed by late Fall 1996. The intensive effort was initiated in November 1995 with citizen advisory committee input, followed by a national input conference in January 1996, and four regional listening conferences in March and April. We intend to use the results of these listening sessions to sharpen our research and extension focus and priorities. We will provide your committee, Mr. Chairman, with a copy of the action plan resulting from this futuring effort.

We are, of course, aware of the new legislation in the FAIR Act of 1996 that creates a new USDA Advisory Board. We applaud the Congress's efforts to streamline the advisory body process and support your efforts to insure that there is adequate input and advice from interested and affected parties as extension and research priorities are set. We are watching with great interest as the Department of Agriculture sets about creating this new board. We appreciated the opportunity to provide the department with nominees for this board. We would suggest that the board, by itself, regardless of configuration, will not be able to provide the breadth and depth of insight into the priority setting process that will be needed. Rather, the board should oversee the process of soliciting this input from across the country, from many diverse groups. It is the process that is essential. We believe that the futuring process and the listening sessions that we have just engaged in can serve as a model for the board. We look forward to sharing the results of these activities with the board.

Utilization of Communication Technology

The day-to-day challenges facing the Cooperative Extension System are very complex and resource demanding. Rapid and efficient access to knowledge bases is critical to meeting the information and education expectations of the people. While we are not fully operational in every local and state Cooperative Extension office in terms of computerized communications systems, we are perhaps as advanced as some and more so than most public organizations. Yet, we have a ways to go. With the ever decreasing funding, in real dollars, we have implemented a variety of staffing patterns within and among states; streamlined our administrative structures; developed more joint programming ventures with public and private organizations; and focused our program priorities more sharply.

The Cooperative Extension community is aware of the interest that this committee and the Department of Agriculture have in developing cutting-edge, computer-based information and program tracking systems. Many components of this system have already been created. Like so many efforts in the computer field, the growth and development is uneven; some locations and issue areas have developed capacities faster than others. The greatest challenge is to create the architecture that will link existing capacities together while stimulating growth in other need areas. We look forward to working with the department as these computer-based information management systems are further designed and implemented.

Recommendations

Funding Mechanism: We highly recommend the federal funding policy mechanism for the Cooperative Extension Services not be changed. The combination of formula and targeted funding works very well in concert with state and local government funding, complemented by non-public funds, to enable the system to be responsive to national and state issues.

The FAIR Act of 1996

It is too early to comment on the new legislation, the FAIR Act of 1996, that pertains to the Cooperative Extension System. The Congress made several deletions, modifications and additions in the rewrite of the Research, Extension and Education Title of the Act. The one major change we specifically wanted made in legislation concerning the eligibility of the 1890 institutions for 3(d) and other targeted funds was taken care of in the Act. We thank and commend you for this action. We will be interested to see how the department implements the changes and provisions in the Act and we look forward to working with this committee, as you continue to examine these important issues.

Thank you for your attention to our comments and recommendations. Mr. Chairman, I will be pleased to respond to questions from you and your committee members.

TESTIMONY OF SAMUEL L. DONALD
FOR THE
ASSOCIATION OF EXTENSION ADMINISTRATORS
1890 LAND-GRANT COLLEGES AND UNIVERSITIES

To the Honorable Chairman Wayne Allard and other distinguished members of the Committee, I appreciate the opportunity to testify on behalf of the Association of Extension Administrators of the 1890 Land-Grant Colleges and Universities including Tuskegee University (1890 Institutions).

Mr. Chairman, Cooperative Extension Programs are fundamental to the mission of the 1890 Institutions. The United States Cooperative Extension System is designed to share the benefits of scientific research and promote leadership in individuals, families and communities, to improve agricultural production and enhance the quality of life of Americans.

The 1890 Institutions have over the years developed special niches for their Extension work as well as broad areas of focus. One niche common to all of the 1890 Institutions has been a focus on disadvantaged members of our society. Our clientele, for the most part, are on the lower end of the income scale, many have marginal resources. These persons are both rural and urban, are small farmers and their families, and are those pursuing small and home-based business opportunities. The development of alternative crops or production strategies offering opportunities for greater profit margins for small operators is another focus. Among the 1890 Institutions considerable expertise and experience has been developed over the years in working with small farmers on vegetables, fruits, specialty trees, food animals, and aquaculture. A critical component of this work has been education and demonstration programs on production, processing or packaging and marketing. Education programs that impact infant mortality rates, child and youth development and teen pregnancies, programs that improve health through nutrition education or home environments through practical courses in repairs and management have served our clientele well.

The 1890 institutions over the years have provided leadership and citizenship training in rural areas so that local people are better able to address local issues, including water systems, community and youth education and recreation, crime, health care and economic development. Conservation and production of natural resources and sustaining environmental quality have also been areas of outreach to small farmers and rural communities. A lot of this work has required one-on-one interactions by extension agents and specialists with individuals, families and communities. The 1890s are proud of the service provided over the years to millions of people - those most in need and those often the hardest to reach.

Mr. Chairman, in closing, the highest priorities for the 1890 Extension Programs are (1) to maintain support for base funding, and (2) to maintain funding to enhance Extension and Research Facilities at our institutions.

The 1890 Institutions depend primarily on funding from Congress to meet the needs of our clientele. Therefore, we continue to seek support for Extension base programs and to enhance facilities at the 1890 Institutions.

Again, thanks for the opportunity to appear before the Committee. If there are questions, I will attempt to answer them.

TESTIMONY PRESENTED TO THE
SUBCOMMITTEE ON RESOURCE CONSERVATION, RESEARCH, AND FORESTRY
COMMITTEE ON AGRICULTURE
U.S. HOUSE OF REPRESENTATIVES

JULY 17, 1996 HEARING ON AGRICULTURAL EXTENSION PROGRAMS

PRESENTED BY TOM GUTHRIE,
FARMER, DELTON, MICHIGAN

ON BEHALF OF THE SUSTAINABLE AGRICULTURE COALITION AND
THE MIDWEST SUSTAINABLE AGRICULTURE WORKING GROUP

Mr. Chairman and members of the Subcommittee, thank you for this opportunity to testify.

My name is Tom Guthrie and I am a diversified family farmer from Delton, Michigan. I farm approximately 1,000 acres, including 400 acres of hay, 290 acres of soybeans, 120 acres of wheat, 85 acres of corn, and 25 acres of spelt. In addition, my family and a neighbor grow and market some sweet corn and vegetables at our farm market. Most of our hay, as well as a blended horse feed made from our corn and speltz, is direct marketed to our customers. A 70 cow-calf beef herd adds a livestock component to our operation. The cows also consume the hay that doesn't get made of the best selling quality.

I am active in the Michigan Farm Bureau (MFB), Michigan's largest voluntary farm organization. I currently serve as vice president and Chairman of the state policy development committee. I also serve on the board and am the former president of the Michigan Agricultural Stewardship Association (MASA). MASA is a nonprofit agricultural organization whose mission is to develop a process for research and dissemination of information about agricultural systems that are "economically feasible, agronomically sound, and environmentally safe." These goals will be pursued by a variety of objectives.

With encouragement and support from both MFB and MASA, I am also involved in the Michigan Integrated Food and Farming System (MIFFS) project. MIFFS is one of 18 projects nationwide that make up the Integrated Farming Systems project of the W.K. Kellogg Foundation. As part of the MIFFS project, I am implementing a Stewardship Plan for Water Quality on my farm.

I also have just completed my 4 year term, including this past year as chair, on the North Central Regional Administrative Council. It has certainly been an honor and a very good learning experience to serve as Michigan's representative on this council. The Council's responsibility is to carry out the USDA's Sustainable Agriculture Research and Education (SARE) program. The SARE program includes a strong extension component which will be the focus of my comments this morning.

I appear today on behalf of the Sustainable Agriculture Coalition and the Midwest Sustainable Agriculture Working Group. The Working Group includes some three dozen midwest-based farm, rural, and conservation organizations working together for federal policy reform to foster a more sustainable farm and food system. The Coalition, a subset of the Working Group, includes 11 midwest organizations and maintains a Washington office headed by Ferd Hoefner. The work of the Coalition and Working Group is carried out by committees on commodity and credit programs, conservation and the environment, marketing and rural development, and research and extension. I am a member of the research and extension committee. I want to thank the Working Group and Coalition for inviting me to be with you today.

I imagine I agree with many of the witnesses before you today that maintaining the federal investment in agricultural research, education, and extension is critical to simultaneously enhancing productivity, profitability, and economic opportunities in family farming and rural communities, and preserving the natural resource base. With respect to the pursuit of these key goals, I believe that the right kinds of research and extension investments collaboratively could yield improvements, in both the medium and long term, that will outperform gains made by independently created financial incentives, technical assistance, regulation, or any other policy mechanisms. Thus, I encourage you to take your responsibilities for research, education, and extension policy with all due care and seriousness.

I would like to highlight two programs for the Subcommittee which, in my estimation, are among the best examples of how federal research and extension investments can leverage local resources for positive change.

Sustainable Agriculture Research and Education

The Sustainable Agriculture Research and Education (SARE) program is a competitive grants program designed to respond to the pressing need for research and demonstration about practical and profitable alternatives for farmers and ranchers who are operating within an expanding set of economic and environmental constraints. The program was first authorized in the 1985 Farm Bill and has been funded continuously since 1988. SARE is administered by the Cooperative State Research, Education, and Extension Service (CSREES), with representation from the Agricultural Research Service, the Natural Resources Conservation Service, and the Environmental Protection Agency.

At the cutting edge of USDA research programs, SARE is a unique regional partnership program. The program is implemented on a regional level by four regional administrative councils, each with its own technical review committees. Representation on administrative councils and review committees includes government, scientists, educators, farmers and ranchers, private non-profit organizations, and agribusiness. SARE is a model for interagency coordination, public-private partnerships, and cost-effective regional administration.

Most SARE research projects use a team approach. Emphasis is placed on whole farm systems research, as well as component research in the context of farming systems. On-farm validation and demonstration are also prominently featured. Increasing farm profitability, optimizing the use of on-farm resources, and protecting our natural resources are key elements of the program.

In the context of today's hearing, it is important to note that since the beginning, SARE has required the integration of research and extension within its projects. Thus, I believe, SARE has been an important model and precursor to the merging of research and extension as the new Cooperative State Research, Education, and Extension Service in USDA's reorganization. SARE projects are also required to incorporate strategies to ensure that findings are made readily usable by producers. This encourages Extension and local agricultural networks and organizations to find new and innovative ways of getting information into the hands of potential end users.

Since its inception, SARE has placed heavy emphasis on having farmers and ranchers provide leadership as project participants, project reviewers, and administrative council members, side by side with scientists and agency representatives. As a note, the North Central SARE Council insists, to the extent possible, that projects be carried out on a working farm. In my opinion, this has been a key to its success. Each of the four SARE regions has also instituted a producer grant program, in which small competitive grant awards are made directly to farmers and ranchers to conduct their own experiments with on-farm innovation. These investments are already paying dividends, with farmer to farmer networks spreading the word about the latest research applications and on-farm results. In the North Central region, for example, we have funded approximately 100 such projects among the 12 states and we do insist that they share the lessons learned with other producers.

The Stewardship Plan for Water Quality on my farm was initiated by a $3,000 farmer grant. These funds would help me address concerns of underground fuel storage tanks and an abandoned dump on some property that I had purchased. The project now looks at all the many aspects of my farming operation and how they relate to water quality. The project brings together individuals from various agencies and organizations, including County Extension, Local Soil Conservation District, Michigan Department of Agriculture, Michigan Department of Natural Resources, Michigan Farm Bureau, Michigan Agricultural Stewardship Association, Natural Resources Conservation Service, the local Lake Association and others who have a stake in water quality.

Sustainable Agriculture Extension Program

As part of the overall SARE program, Congress created the Sustainable Agriculture Technology Development and Transfer Program (SATDTP) in the 1990 Farm Bill and funded it for the first time in fiscal year 1994. The SATDTP, USDA's fledgling training and outreach program in sustainable agriculture, is administered through the Cooperative State Research, Education, and Extension Service and utilizes the existing regional administrative councils of the SARE program to administer funds and coordinate the program with its SARE research and education base. The portion of the program currently being implemented is now commonly referred to as the SARE Professional Development Program.

The Professional Development Program is nationally-coordinated and state and regionally-based. Training consortia or networks have been established in all four regions of the country to coordinate educational activities and offer instructional programs for Extension and others who have educational responsibilities for sustainable agriculture. Special training projects have also been funded in each region. Both the four consortia and special projects were chosen by a competitive grants process.

In addition, as part of this program each state has named a sustainable agriculture extension coordinator and initiated a sustainable agriculture strategic planning process with broad participation from many different stakeholders. All state strategic plans were completed in 1995 and are now proceeding with implementation plans and activities.

The target audience for the Professional Development Program includes agricultural extension agents, Natural Resource Conservation Service and Consolidated Farm Service Agency field staff, and private consultants and other agricultural professionals, as well as farmers and ranchers. A good, credible training and continuing education effort is critical for farmers and farm service providers to be able to learn about sustainable agriculture research and demonstration results and to utilize that knowledge in site-specific applications.

I am pleased to report that in my state, Michigan, implementation of this professional development outreach program is being carried out as a partnership between Michigan State University - Extension, the Michigan Agricultural Stewardship Association, and the state office of the Natural Resources Conservation Service. The three entities entered into a cooperative agreement in June of this year to jointly undertake training and education responsibility in the theory, practices, and systems of sustainable agriculture.

The program will consist of 15 professional development modules dealing with such topics as on-farm research, soil quality, rotational grazing, agro-forestry, and value-added opportunities. Participants will also be concerned about community development, with community leaders as well as farmers and ranchers becoming teachers as well as learners through this endeavor.

I am excited about the prospects for this innovative public-private partnership. Farmers have been successful in conducting on-farm research and demonstration, soliciting and exchanging information from their colleagues, and working with non-profit mutual support organizations. Both Extension and NRCS will benefit, I believe, from working with farmer networks as facilitators and information brokers, rather than as resident experts. Our Michigan partnership reflects this new thinking about the role of Extension.

Some farmers rely less and less on Extension as other sources of information become available. Extension has become more involved in issues not directly, though certainly often indirectly, related to farming. The ever-increasing demand for ways to make agriculture more profitable as well as more ecologically beneficial provides an opportunity for Extension to revisit its role. Exploring the many alternatives that may be available may offer opportunities for revisions than can be adapted and adopted in ways that will enhance the Extension of the future. The need within NRCS and FSA for this kind of rethinking is also growing as they are called upon to deal with total resource management systems and to administer various new conservation and sustainable agriculture-related programs.

With more adequate funding, the Technology Development and Transfer Program should become a natural outlet for information gathered by the SARE and related USDA science and education programs, providing a vehicle for its wider distribution. At the same time, farm level priorities and feedback through program's outreach efforts should help inform the research agenda. The program could also will provide an important means for a verification and integration of the research results from USDA's sustainable agriculture, water quality, integrated pest management and related programs.

National Research Council's Land Grant Report

Before closing my comments today, I want to call the Subcommittee's attention to a number of the Extension-related recommendations of the recently released National Research Council report entitled *Land Grant Colleges of Agriculture: Public Policy and Public Service*. The Council recommended that:

* receipt of USDA-administered research and extension funds should be contingent on bringing a wide variety of stakeholders into a process of systematic prioritization of research and extension issues;

* significant shares of total USDA-administered extramural funds, including extension, should provide incentives for regional centers, consortia, programs and projects that effectively integrate and mobilize multi-state and multi-institutional resources;

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* federal funding for research and extension should be combined into a single allocation, requiring that the use of these combined funds reflect a coordinated effort to link and integrate university research and extension in the national interest, including a special emphasis on interdisciplinary programs and projects;

* all national extension initiatives should be available on a competitive basis to land grant and nonland grant institutions and organizations and provide incentives for multistate and regional extension programs and new and innovative approaches to the delivery of extension services.

I am struck by the congruence between the Council's recommendations and the current status of the SARE programs. Multiple stakeholders are a built-in feature of the SARE partnership. The programs are regionally-based and the extension program works through regional consortia. Many of the projects funded through the research and education and the professional development program are multi-state and multi-institutional. More so than any other USDA research or extension program, research and extension components are closely coordinated. A strong emphasis is placed on interdisciplinary systems projects. And last but definitely not least, all funds are available on a competitive basis and are open to land grant and nonland grant institutions and organizations alike.

Conclusion

After reading the Council's recommendations, it seems increasingly clear to me that the SARE programs are on the cutting edge of where more federally-funded agricultural research and extension programming should be headed. I am encouraged by the progress being made by these programs. They are, in my opinion, working quite well, though with very limited budgets. Current funding levels represent only one-half of one percent of the total USDA research and extension budget. In the next few years, USDA and Congress should work together to give greater priority to this type of partnered, systems-oriented agricultural research and extension initiatives in general, and these innovative programs in particular.

Sustainable agriculture relies less on purchased inputs and more on design and management of the farming system. Sustainable agriculture involves a high degree of management and complex decision-making. This implies a strong need for information about management options. Extension at its best can help farmers access and integrate management and farming systems knowledge and undertake education efforts on decision-making skills and support systems. Extension should also consider more widespread adoption of working with farmers and farm organizations to facilitate farmer research, information sharing, and collective problem-solving. Extension could also help farmers and communities organize to take better advantage of sustainable agriculture's inherent crop and product diversity through on-farm and local community value-added and alternative marketing strategies.

I, for one, am optimistic that Extension can and will fill these needs. Creating an agriculture that makes most efficient use of all natural resources will continue to play an important role in sustaining rural communities in the next century. Revising and reinventing farming systems and Extension's role in them may not always be easy, but there exists an enormous opportunity in making the best better. It is my strong hope that the SARE programs, especially the professional development program and related outreach efforts, will play a key role in defining the future for agricultural extension programs.

Agricultural Research, Education and Extension:

The Only Way to Feed the World and Save Its Wildlife For All Time

Statement by Dennis T. Avery,
Director of Global Food Issues, Hudson Institute
before the
House Agriculture Subcommittee on Conservation, Research and Forestry,
hearing on the future of agricultural research, education and extension,
July 17, 1996

Throughout man's history, he has taken his food supply at the expense of nature.

-- In the earliest days, man hunted wild animals, stole wild birds' eggs and gathered nuts, berries and seeds. Famines often interrupted the growth in human numbers, or there would have been no game animals left on the earth by the time of Christ.

-- With the invention of farming, human numbers began to rise rapidly, and mankind began to convert huge tracts of wildlands to crops and pasture. Today, a full one-third of the world's surface is given over to agriculture, a total which dwarfs the 1.4 percent of the land area dedicated to cities.

-- The American Indian culture was no less dependent on taking food from nature than the cultures that have followed; it was just less effective in producing a secure food supply with high yields per acre. The Indians extensively burned forest underbrush so they could hunt more efficiently. They drove whole herds of bison over cliffs to harvest a few animals. By the time the Pilgrims arrived, the Indians had extended corn cultivation all the way from its original home in Mexico to Massachusetts. Given time, it is likely that the Indian culture would have become as dependent on converting wildlands to farming as the Pilgrims.

The Environmental Importance of High-Yield Farming

In the past 150 years, however, humanity has found a new way to feed itself without taking more of nature's resources. That solution is high-yield farming. With plant breeding, hybrid seeds, chemical fertilizer, irrigation and chemical pest control, man has learned to produce more food without taking more land from nature. That success has been achieved through agricultural research, education and extension programs.

Inexplicably, for all of the praise we have heaped on the Green Revolution for preventing famine, we have failed to see its corollary benefits. For all the praise about increased food safety in the modern world, with victories over bovine tuberculosis, human stomach cancer and botulism, we have failed to see that higher-yield farming makes it possible to *feed more people and still preserve wildlife.*

The world today is cropping the same 5.8 million square miles of land that it cropped in 1965, though we are feeding twice as many people, and feeding them a far better diet. When we take into account the increased production of meat, milk, eggs and oilseeds, we have effectively tripled the output of world agriculture since 1965 without taking any more land. Without the contributions of high-yield agriculture, the world would already have sacrificed another 10-12 million square miles of wildlife to lower-yielding crops and livestock. We would have plowed down the equivalent of North and Central America to avoid using such things as hybrid seeds and man-made chemicals.[1]

The only places which have taken substantial tracts of poor land from wildlife in the past 35 years are places where farmers have not been practicing high-yield farming.

-- Africa has increased its cropland requirements, mainly by shortening its bush-fallow periods. (A forest can lose up to half of its wild plant and tree species without ever being cleared, due to shortened bush fallow periods that prevent the climax species from reproducing.)

-- Ecuador, which has not raised its yields, has been expanding its cropland at the expense of its forests at about 2 percent per year. Chile, with very similar agroclimatic conditions, has used high-yield technology to radically expand its food production -- and farm exports -- without accompanying loss of land from forests.

In fact, high-yield farming has been so successful that First World countries have had farm surpluses with serious negative side-effects. The surpluses apparently led environmental activists to assume we could afford low-yield farming. It also led to the travesty of setaside cropland -- land deliberately kept in limbo, producing neither crops nor wildlife. (Meanwhile, wildlife was being displaced for crop production in other countries which could not yet afford the foolishness of wasting cropland.)

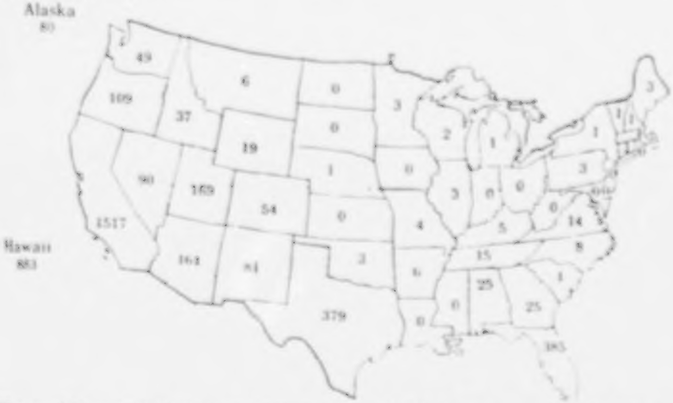
The general public saw the "surpluses" and thought high-yield agricultural research and technology had already been overdone. My father retired as an agricultural extension agent in 1960, believing that his beloved research and extension programs were no longer much needed.

But while the First World has been agriculturally preoccupied with the "farm surpluses" induced by their subsidies, Third World countries have been trying to deal with urgent food problems. Their death rates have been falling more rapidly than their birth rates, leading to a major one-time surge in population numbers. In addition, their incomes have been rising broadly and rapidly due to technology improvements and trade opportunities.

Larger, more affluent populations can put enormous pressure on farming resources Not only do affluent people eat more calories, but they eat far more high-quality protein (meat, milk and eggs) with three to five times the per-caloric resource cost of food grains The conversion of wildlands to croplands has not been extensive yet -- but the food challenge of the 21st Century is to triple the world's farm output over the next 45 years

It should be possible to feed the world's human population *from here through the rest of time without taking anything more from nature* However, that is foreseeable only through the higher-yield agriculture made possible by agricultural research, education and extension

Ecologists tell us that converting more land to crops, and pasture in the future will be much more costly in terms of wildlife species than the cropland we have already converted They tell us that there is far more biodiversity on the world's poor-quality land than on the land with good quality for farming [7] Good land typically has thriving populations of a few species, while the stressful conditions of poor land stimulate much larger numbers of species As an example, Indiana and Ohio have no unique, endemic plant species (and apparently never did) In contrast, Florida and Texas each have more than 350, and California has more than 1500 Those states are warmer, and have more poor-quality land



The world's current food gap is emerging in exactly the places currently harbor three-fourths of the world's wild species -- the densely-populated tropics with warmer temperatures and poorer-quality land

Modern Farming Is Both Sustaining and Sustainable

High-yield farming is not only the most productive farming in history, but also the most sustainable farming discovered by humanity in 10,000 years

Soil erosion has always been the Achilles heel of crop production. Throughout recorded history, mankind's crop production has been unsustainable because it permitted too much soil to be stolen by wind and water.

But when we triple the yields on the best cropland, we cut soil erosion per ton of food produced by two-thirds. That's simple arithmetic. If we eliminate the need to push crops onto the steep and fragile acres, high yields cut erosion by more than two thirds.

That still didn't make farming fully sustainable. However, since 1970, high-yield farming has made another, equally-dramatic advance against erosion, called conservation tillage. Conservation tillage doesn't use "bare-earth" techniques like plowing, fallow land or mechanical cultivation to control weeds. Instead, it uses herbicides. Conservation tillage, backed by chemistry, cuts soil erosion by another 65-95 percent per acre, saves moisture, and protects sub-soil populations of microbes and earthworms. Conservation tillage is already being used on hundreds of millions of acres in the U.S., Canada, Western Europe, Brazil, Argentina and Australia. It has even succeeded in hand-powered African agricultures such as Kenya and Zimbabwe.

Organic farmers refuse to use conservation tillage because it employs herbicides.

Low-input farmers use it reluctantly.

The Potential for Still-Higher Yields

Despite the higher yields which have been achieved, there is still major potential for further yield increases. The favorite argument of the pessimists is that we are dealing with the law of diminishing returns. However, our experience seems to indicate that we are dealing less with the law of diminishing returns than with the serial removal of constraints to higher yields.

At the turn of the last century, an American farmer could only get about 30 bushels of grain per acre of corn or wheat. His biggest constraint was the competition from weeds, so he had to fallow his wheat land. And he had to keep his corn plants widely-separated in 30-inch rows -- so the horse-drawn cultivator could be pulled both up and across the rows. This limited his corn planting to about 5,000 corn plants per acre.

The farmer's second big constraint was fertility. If he took out more nutrients than he added back to the soil, his farm would "wear out," as many American farms did in the 19th century. The only ways the farmer had then to replace the plant nutrients were to rotate crops with pasture, and to apply manure from the barn. The crop-pasture rotation meant the farmer could only harvest three grain crops in seven years on any given field. Fertility levels never got very high -- because the pasture would support only so many animals, and barnyard manure was limited.

Crop rotation was also the only insect control. The better the farmer's corn crop, the more attractive his fields became to insects.

As a result of these constraints, a Corn Belt farm in 1900 could average only about 30 bushels of grain per acre from two corn crops and a wheat crop every seven years -- or 13 bushels per acre per year.

Today, the farmer can control his weeds with chemical weed killers, so he doesn't need to check-plant his corn field. Nor do the rows have to be far enough apart to let a horse walk between. Instead of 5,000 corn plants per acre, many farmers are planting 30,000. The full menu of plant nutrients, including 26 trace minerals, is provided according to soil tests. The farmer uses the available manure *supplemented with chemical fertilizers*. There's plenty of organic matter, because a field producing 175 bushels of corn also produces lots of stalks and crop residue which are tilled back into the topsoil.

Integrated pest management uses crop rotation, timing and a variety of chemical pest killers to keep insect populations down to tolerable levels.

Thus today's Corn Belt farmer doesn't need to use his prime cropland for pasture or clover. He can grow big crops of corn, wheat and soybeans almost every year. Soil microbes and earthworms thrive in fields that no longer have to be plowed to keep down the weed populations. (Soil microbes hate being plowed.)[3]

Today's Corn Belt farmer can grow three 175-bushel corn crops, two hefty soybean crops, and one crop of 80-bushel wheat in a seven-year period. That's the equivalent of 109 bushels of grain per acre per year -- or *8 times the yield of the early 1900s*.

What about the future? One seed company is already testing a corn variety that can tolerate crowding at 50,000 plants per acre. What if such high plant populations are protected with supplemental irrigation systems for the occasional dry spell -- so the farmer can fertilizer and manage for 300-bushel yields? How much yield gain will the corn farmer get from bred-in Bacillus thuringiensis to kill corn borers? How much additional plant energy can biotechnology shift from growing stalk to growing grain?

The Dutch scientist C.T. deWit calculated 30 years ago that the world's maximum edible crop yield was 6-9 tons per acre, depending mainly on distance from the Equator. The world's current average corn yield is only about 2.5 tons, and the average yield for rice is only 3.5 tons (even with irrigation on most of it). A yield of 175 bushels per acre is 4.5 tons, so the American Corn Belt farmer is at only half his theoretical maximum -- and coming closer than any other farmers in the world except for the best of China's irrigated rice producers.

Biotechnology may even raise the theoretical maximum above deWit's calculations[4]

That doesn't repeal the law of diminishing returns -- but it seems to leave quite a lot of room within the statute

Nor have we given appropriate credit to high-yield research and technology in forestry While the farmers of the world must triple their output over the next 45 years, the world's demand for forest products will increase tenfold[3] (Or else we will have to shift heavily to more environmentally-costly materials such as steel and concrete)

The future potential for high-yield forestry looks striking, according to Roger Sedjo, the widely-respected forestry expert from Resources for the Future Sedjo says a well-managed Swedish natural forest currently produces about 3 cubic meters of pulpwood per hectare per year, a Georgia yellow pine plantation produces 15 cubic meters, and a plantation of cloned and tissue-cultured yellow pine in the "exotic" environment of coastal Brazil produces 50 cubic meters of pulpwood per hectare per year

In addition, we have computerized sawmills to get the maximum amount of lumber out of each log, and we have learned to make useful things with chips and scraps we used to throw away (The fibers are held together effectively by new miracle adhesives) This improved forest product technology has increased the productivity of an acre of harvested trees by more than five-fold [4]

Sedjo says we should be able to produce all of the forest products for 9 billion people by planting about 5 percent of the current wild forest area to high-yielding plantations The tree plantations themselves would be good wildlife habitat even if they are not completely "natural" for their settings The key element, however, is that they would permit us to protect 95 percent of the world's wild forests from any logging except that needed to maximize the health of the forest and wildlife Unfortunately, we are not planting the tree plantations today for harvest 25 years from now and the environmental movement is opposing the concept The result will be severe logging pressure on some major wildlife habitats, especially in southeast Asia

Between the high-yield farming and the high-yield forestry, we have the realistic possibility of saving 95 percent of the world's existing wildlands and 97 percent of its wildlife for all time

Accepting the High-Yield Reality

The concept of high-yield conservation didn't just fall off a truck I am the son of an agricultural extension agent who grew up with the miracle of agricultural research, and I have spent a 30-year career as an agricultural analyst, first for the U S Department of Agriculture, and then for nine years was the senior agricultural analyst for the U S Department of State I was an invited presenter at this year's American Association for the Advancement of Science national conference in Baltimore The concept has been endorsed in the *Bulletin of the Ecological Society of America* [5] An article on it has been accepted by *Choices*, the peer-reviewed magazine of the American Agricultural

Economics Association for publication early next year. It has been presented in testimony to both the House and Senate Agriculture Committees, and to the Endangered Species Task Force of the House of Representatives. Hudson's book, *Saving the Planet With Pesticides and Plastic: The Environmental Triumph of High-Yield Farming*, was published in 1995, and is now in its seventh printing.

The high-yield conservation concept has been debated at hundreds of environmental conferences, college campuses and farmer meetings across North America over the past three years. It is being widely debated and accepted in dozens of foreign countries, from Brussels to Brisbane, from Beijing to Buenos Aires.

The results of the debate are clear. The environmental movement has no counter-argument. By and large, they have simply tried to pretend that the high-yield concept of conservation doesn't exist.

Or they have accused the Hudson Institute of being a tool of big chemical and forest-products companies. But this debate cannot be resolved on the convenient-but-shallow basis of "conflict of interest." The environmental movement's own conflict of interest is too great. The environmental movement has gained billions of dollars worth of donations, memberships, subscriptions and grants from villainizing pesticides and high-yield forestry.

Only one environmental group has dared to publicly challenge the Center for Global Food Issues on high-yield conservation. The Henry Wallace Institute for Alternative Agriculture last year issued a report accusing the Center and Dennis Avery of "perpetrating the newest agricultural myth" -- that high-yield farming can meet all of our food production and environmental goals.[6] (Actually, we don't claim that high-yield farming *can*, though we have solidly-based hopes that it will with successful further investments in the agricultural research process; we do declare that low-yield farming *cannot*.)

Amazingly, however, the Wallace report never contested our claim that high-yield farming is the only hope for feeding the projected world population without destroying millions of square miles of wildlife habitat. Instead, they charged that intensive farming was too dangerous to wildlife. In particular, they cited two cases, presumably among the worst cases of high-yield farming's danger to American wildlife.

-- The Wallace report pointed out that oyster populations in the Chesapeake Bay have dropped by 94 percent in the last century. The report blamed this on farmers' over-fertilization of the Bay. The report did not mention that urban activities are the largest source of over-fertilization (and the most important because of seasonality). Nor did it point out that farming's contribution to the Bay's fertility levels comes substantially from legume crops and manure as well as from chemical fertilizer. *Incredibly, Wallace also failed to mention that the Chesapeake's oysters have been ravaged in recent decades by the MSX virus.*

-- The report cited a 1991 study by William and Mary University which estimated that 6 percent of the eagles in the James River estuary of Virginia were being killed by secondary pesticide poisoning *The Wallace report didn't tell its readers, however, that in 1992, the regulatory system worked* The State of Virginia proposed a ban on the granular soil insecticide responsible, because of "hundreds of bird deaths over a period of years " (The bird deaths were mainly doves and other prey birds, which ate granules left on the surface, either mistaking them for food or eating them as grit) The chemical's maker responded by taking the formulation off the market nationwide

Can such small and badly-documented wildlife risks offset the preservation of millions of square miles of wildlife habitat? (If Virginia had instead taken all farm pesticides off the market, it might have had to plow down an additional 1 million acres of wildlife habitat to make up the lost yield!)

Interestingly, we talked subsequently with an author of the Wallace study about our mutual interest in promoting agricultural research to help protect the environment We began discussion of a coalition That foundered when we insisted that one of the key public arguments for more agricultural research funding had to be *preservation of wildlife habitat*

The White House has just issued a new report, noteworthy in its praise of agricultural research and laying out "A Research Agenda for American's Health, Safety and Food "[7] Remarkably, coming from an administration which prides itself on the high priority it has attached to the environment, it says not one word about the importance of high-yield agriculture in preserving wildlife habitat and environmental resources!

Instead of praise for its environmental contributions, modern agriculture today faces policies that are deliberately hostile to both the discovery and the regulatory approval of key high-yield inputs for the future -- especially new-mode pesticides and biotechnology The Administrator of the Environmental Protection Agency has established a goal of "reducing pesticide use," without specifying how this is likely to help human or environmental health Federal and State regulators seem to be in a race to see who can throw up the biggest, mostly costly testing barriers against new pesticides; as a result, the registration cost for a new compound is now more than $100 million *after* the compound has been discovered and gone through its initial testing for efficacy and safety

The U.S. regulatory approval of bovine somatatropin was held up for years with no scientific basis of danger to people, cows or the environment Austria has just shut down the only biotech field experiment ever attempted in that country, again without a shadow of real danger to people or the environment Biotech research programs are fleeing Europe because of hostility *from environmental activists*

This is *not* an effective prescription for getting the higher-yield agriculture so urgently needed for the future

Why Public Research Funding for Agricultural Research?

Public money for high-yield agricultural research today is not a matter of enriching big farmers, since competition clearly spreads the rewards of new technology thinly among farming's best managers.

The major beneficiaries of agricultural research were always consumers, who benefited as farmers used new research and technology in competing to supply the consumer. It is still valid to invest in further reductions of U.S. food costs, but there is not much urgency to achieving the goal of cutting food costs from 10 percent of our consumer spending to 9 percent.

It may be that public investments in agricultural research are especially valid now that our farm production subsidies have ended and our farmers are being told they must prepare to find their incomes in the world market. With high U.S. living standards, high productivity per man-hour and per acre are vitally important to sustaining America's comparative advantage in farm production, and it is difficult for individual farmers to conduct or finance such research.

By far the strongest rationale for public-financing of high yield agricultural research today is our rising priority on environmental preservation. We must fund research, education and extension to help the world save its wildlife and wilderness areas.

Remarkably, although none of the research rationales seems to endorse much research on *low-yield farming* much of our agricultural research funding is being channeled down that blind alley.

Low-yield farming may compete effectively on per-unit production costs in some crops and in some regions by minimizing input use. However, not much research spending seems warranted on fairly simple subtraction studies. Humanity has had 10,000 years of unsuccessful experience in trying to identify ways to raise productivity without high-yield inputs.

Organic farming made more sense when it was developed, over 100 years ago. At that time, crop yields were low, organic matter was scarce, and animal manure was relatively abundant compared to the number of humans. Today, high-yield crops produce their own organic matter in abundance -- and manure is scarce. (The world probably has less than 20 percent of the organic nitrogen to support today's farm output, let alone tripling for the future.)

In regard to protecting consumers from chemical residues, the National Research Council has just rendered the most eminent and comprehensive finding ever delivered on pesticide residues. The NRC's new report, *Carcinogens and Anti-Carcinogens in the Human Diet,* does not claim zero risk from pesticide residues -- but only because *nothing* carries zero risk. The NRC panel examined all the sources of cancer risk in our food supply -- and concluded that we are probably at more risk from the *natural* pesticides in our fruits and vegetables than from the pesticide residues. The average potency of many of the natural carcinogens was higher than that of the synthetics, and we consume far more of the natural compounds than of the synthetic residues. The panel said the biggest risk it could find in our food supply is that we eat too much of it. (Especially too much fat.)

Essentially, the panel recommended that we consume *more* of these carcinogens. It found that neither the natural nor man-made carcinogens were present at high enough levels to represent risk -- and they are found primarily in the fruits and vegetables which are mankind's strongest weapon against cancer. Eating five fruits and vegetables per day effectively cuts cancer risks in half.

Our Stolen Future, a new scare book about old pesticide residues, is based fundamentally on the idea that human sperm counts have been falling. However, the scientific community has already rejected this concept loudly and effectively. The book's authors believed studies which assumed that sperm counts are comparable around the world, they are not. There is no evidence of a decline over time in human sperm counts, only of regional variation. Nor is there any validity to the idea that humans have built up immunity to natural estrogens, since birth rates in Tibet still rise and fall with the proportion of peas and barley (and their accompanying natural estrogens) in the Tibetan diet. Humans get about 40 million times the exposure to estrogen mimicry from our diets as from pesticide residues.

It is also remarkable that *Our Stolen Future* is basically trying to frighten the public over the effects of pesticides which have long been banned, and compounds such as PCBs which are not only banned but were never used as pesticides. Thirty-five years after the publication of *Silent Spring*, the environmentalists still cannot document any of Rachel Carson's luridly poetic fears about robin deaths or cancerous pesticides. As for *Our Stolen Future*, whose authors admit they cannot prove danger and don't really expect to, if DDT residues turn herring gulls homosexual, this should have been reflected in herring gull populations over the 35 years that DDT and PCB residues have been present in the environment.

These findings seem to eliminate the anti-pesticide movement's *claims* of consumer health risks. (I emphasize the word claims, since they were never able to document either the risks of cancer or of endocrine mimicry.) Those claims were the environmental movement's basis for demanding to share the nation's agricultural research and education budgets.

That leaves only protection of the environment as a rationale for encouraging low-yield farming. Remarkably again, the supporters of organic and low-input farming seem not to have any research that documents their farming systems are anything but a major threat to wildlife, because they would radically reduce available habitat.

The evidence now gives the public a better environmental rationale for cost-sharing research with Fortune 500 chemical companies (on new modes of pesticide action) than for supporting research on organic and low-input farming. (I certainly would not recommend such cost-sharing. I would rather see us modify the regulatory environment to reflect the demonstrated benefits of pesticides on human and environmental health.)

We cannot leave the question of public research funding for agriculture without examining America's particular responsibility for high-yield farming and high-yield research.

-- First, America has led the world in high-yield farming research and development from its beginning. (Both George Washington and Thomas Jefferson were early leaders in applying the scientific method to agriculture.) Today, America is still the world's leader in cutting-edge farming technology, and there is no illusion that the Third World is yet able to pick up the mantle of agricultural research leadership.

-- Second, the U.S. is the world's most advantaged agriculture, in terms of prime cropland, low-cost water transport, sustainable farming systems, agricultural research institutions and computer-literate farmers. America's average cropland may well have three times the yield potential and one-tenth the soil erosion risk of the average acre in Indonesia or the Philippines. The marriage made in economic and environmental heaven is the underused farm output potential of America and the huge food gap opening in the densely-populated countries of Asia.

America must continue to pursue its leadership in agricultural research, education and extension for the sake of its rural communities, for the health of its trade balance, and for the sake of the natural environments throughout the whole world.

The Environmental Movement May Now Be the Biggest Danger to Wildlife

Meanwhile, the environmental movement has offered "solutions" to the farm/food problem which have proven to be mostly mythical:

-- Environmentalists have hopefully suggested the world population might decline instead of rising, due to overcrowding, disease, and general "malaise." The opposite is happening. The Third World is instead getting richer, better-educated, rapidly reducing its infant mortality and building taller buildings to house its people. Projections of declining births per woman indicate the world population will rise to a peak of about 9 billion before it begins to shrink again about the year 2050 (because affluent countries always have lower birth rates). There is no population crisis, and there is no upward population spiral. There is only a one-time population surge that is already come three-fourths of the way to stability in one generation -- and which will be followed by a slow, long-term population decline.

-- The environmental movement for decades has promised to make the world vegetarian, which *would* ease the burden of providing farming resources for meat production.

However, there has never been a voluntarily-vegetarian society in world history. Currently, higher incomes are raising Chinese meat consumption by about 4 million tons per year, and drove a 25 percent increase in Indonesia's broiler flock in 1995 alone. India's consumers are trying to get an additional 2 million tons of milk per year despite a severe feed shortage. Two thirds of the Hindus in India say they will eat meat (though not beef) when they can afford it. There is no sign yet of a vegetarian future, and *the environmental activists have only a decade or so to produce vegetarianism on a global scale* if they hope to have it save the wildlife.

-- Famine would not "leave more room for nature." Famines do not occur until the local people have hunted down every possible creature and seed for the stew pot, and plowed down their wildlife habitat for low-yielding crops.

The "solutions" offered by the environmental movement are a cruel hoax on the environment itself -- because they are mythical and impossible.

Meanwhile, the environmental activists are attempting to eliminate pesticides, discourage the use of chemical fertilizer, block the adoption of biotechnology, prevent the planting of high-yield tree plantations and take society back to the Stone Age. But people will not accept a return to the Stone Age. They will not give up refrigeration for their foods and go back to high rates of stomach cancer. They will not accept high rates of infant mortality for lack of modern medicine. They will not give up their hopes for a better future for themselves, and especially for their children. Life in Hong Kong or Singapore today is infinitely more rewarding than the traditional life of stoop labor in a mud-walled illiterate village.

No wonder the World Resources Institute recently issued a new report [8] envisioning a future world with "storm-battered islands of biological diversity in a sea of human settlement. . . as wildlands give way to farm, pasture and settlements." The WRI report recommends setting aside "bioregions" to protect critical wildlife habitat from the human encroachment which they see as inevitable.

Fortunately, however, there is another, better way to protect wildlife than trying to set aside a few bioregions that cannot encompass all of the species and all of the critical habitat.

The better way is to increase our investments in agricultural research, technology, education and extension. The better way is to raise more food from the same land. The better way is to triple our crop yields -- again -- on the best cropland all over the world, using agricultural research, education, extension and free farm trade.

That effort must be led by the only country which *can* lead it, the world's leader in both science and trade, the United States.

Dennis T. Avery was formerly the senior agricultural analyst for the U.S. Department of State. He has also served as an agricultural policy analyst for the U.S. Department of Agriculture and President Johnson's National Advisory Commission on Food and Fiber. He is the author of two books published by the Hudson Institute: *Global Food Progress* (1991) and *Saving the Planet With Pesticides and Plastic: the Environmental Triumph of High-Yield Farming* (1995).

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[2] Dr. Michael Huston, *Biological Diversity*, Cambridge Press, 1994, pp. 551-570.

[3] E.R. Zaborski and B. R. Stinner, "Impacts of Soil Tillage on Soil Fauna and Biological Processes," *Farming for a Better Environment*, Soil and Water Conservation Society, Ankeny IA, 1995, pp. 13-15.

[4] J.L. Bowyer, "Successes and Failures in Process and Product Technology," and "Analysis of Growth of Competing Materials," University of Minnesota Department of Forest Products.

[5] Dr. Michael Huston, "Saving the Planet," *Bulletin of the Ecological Society of America*, June, 1996.

[6] Tracy I. Hewitt and Katherine R. Smith, *Intensive Agriculture and Environmental Quality: Examining the Newest Agricultural Myth*, Wallace Institute for Alternative Agriculture, Greenbelt, MD, 1995.

[7] *Meeting the Challenge: A Research Agenda for America's Health, Safety and Food*, National Science and Technology Council Committee on Health, Safety and Food, Executive Office of the President, Washington, D.C., 1996.

[8] K.R. Miller, *Balancing the Scales: Guidelines for Increasing Biodiversity's Chances Through Bioregional Management*, World Resources Institute, Washington, D.C., Feb. 1996.

Animal Agriculture Coalition

Testimony Regarding The Extension Service

before the

House Agriculture Subcommittee on Resource Conservation, Research and Forestry

submitted by

The Animal Agriculture Coalition

July 17, 1996

Mr. Chairmen, thank you for providing the Animal Agriculture Coalition an opportunity to testify at this hearing on the Extension Service. My name is Gary Weber. I work for the National Cattlemen's Beef Association here in Washington, DC. We are just one member of the Animal Agriculture Coalition. My comments today represent the position of our coalition.

Livestock and their products represent over 50 percent of farm and ranch income. They also represent value added products which contribute to the vitality of rural communities.

Livestock producers must meet the high expectations of the consumer for safe, wholesome and affordable food. At the same time, in concert with Veterinarians and Animal Scientists, we must address the publics' concerns regarding the impact of agricultural production systems on the environment and food safety.

We support federal government investments in agricultural research and extension. Previous investments have produced a more than offsetting return to the taxpayer, in terms of low cost, safe and wholesome food, and increased business activity and resultant vitality of rural communities.

An Economic Research Service comprehensive literature review indicated there have been more than 64 reviews of the return on investment in agricultural research and extension from 1915 through 1985. These 64 studies document a conservative average return of 46.7%. Agricultural research and extension continues to be an excellent investment of public resources.

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Federal investment and partnerships in the agricultural research and extension area are important. We need the Federal partner to provide leadership to ensure Federal investments are targeted to national priorities regarding food and agriculture from the farm to the table. It is also imperative there is competent national program leadership provided by the Federal partner in the system.

The following statements represent the views of the Animal Agriculture Coalition regarding the focus of Federally funded Extension programs.

1. The public expects farmers and ranchers to produce an abundant supply of affordable, safe and wholesome food. These production systems must be profitable for the farmer and rancher and globally competitive. At the same time, these production systems must be designed to protect the natural resource base critical to their sustained productivity.

    A. The Extension system needs to target resources to ensure farmers and ranchers are able to successfully manage their complex productions systems in a manner which meets the expectations of the public, as well as the needs of the producers.

This requires the Extension system to target resources to develop applied research and demonstration programs which will build **"Whole Farm and Ranch Integrated Systems."**

B. Extension needs to design systems to improve **producer access to research based information, methods and practices**. The access must be tied to **decision support systems** so the wealth of research based information available can be successfully reviewed and considered for applicability to each individual farm or ranch integrated system.

We support continued development of the CD-ROM based databases and decisions support systems currently being developed by the system.

C. The issue of food safety is a high priority for the Animal Agriculture Coalition and the public. Extension must continue to expand programming to ensure all farmers and ranchers have the necessary information and education to prevent violative residues in products and other potential food safety concerns.

D. The Federal Extension component must employ capable, competent staff to provide the necessary national program leadership, coordination and training to successfully meet the challenges facing animal agriculture.

It is imperative the Federal Extension staff include a **National Program Leader for Extension Animal Science, as well as a National Program Leader for Extension Veterinary Medicine.**

E. We support the development and activities of the recently mandated, single Advisory Council to establish and manage a process to determine priorities for all research and Extension programs.

Thank you again for this opportunity to discuss our support for Extension programs. We continue to have faith in the design and potential of the Extension System. Through proper priority setting processes and a focus on the aforementioned priorities, the system can continue to be relevant to animal agriculture and all of society dependent upon the fruits of agriculture.

Good morning Mr. Chairman and members of the subcommittee. Thank you for the opportunity to appear before you today. I am Ken Rose. I grow wheat, sorghum and corn and run cattle on my farm near Keyes, Okla. The economies of agriculture ensure that I must take a certain amount of risk to earn a profit. Research is the most effective tool I have in reducing that risk. It is the means by which I can remain competitive in an ever changing world.

The over-supply of cereal grains and low commodity prices of the 1980s gave justification for a tremendous cutback in research on production agriculture in our land-grant universities. It was argued that the main problem was one of surplus production and environmental concerns associated with modern farming practices. Funding for research on the "nuts and bolts" of corn, wheat, soybean and sorghum production agronomy fell dramatically at the state and federal level. Many commodity boards followed suit by diverting much of their check-off funding from plant research to research on end-use value enhancement and marketing.

Today, in 1996, global food supplies are at all-time lows and commodity prices are at all-time highs. The questions we must now ask are these:

- What if these events are harbingers of future trends?
- How fast could we reassemble the talent at our universities and USDA extension facilities needed to address the "nuts and bolts" production constraints that will limit our ability to double global food production in the next 20 years while preserving soil and environmental quality?
- How can our farmers remain the most competitive in world markets in the next century without a continuous stream of innovation and scientific discovery?

The greatest economic and environmental benefits to our agricultural production systems have come from field-based, problem-solving research and conventional breeding efforts. Reduced tillage systems and new designs of agricultural equipment, improved nitrogen (and other nutrients) management based on soil testing in commercial laboratories and advice from professional crop consultants, integrated pest management and a continuous flow of new crop varieties from the seed industry all owe their development to investment in public-sector research. Indeed, many studies have shown that **the rate of return on investment in this kind of agricultural research is typically above 40%, and is rarely matched in private industry**.

Specific examples of how such research has advanced the sorghum industry include:

- The development of **greenbug resistant** lines of sorghum germplasm. The return on investment from this one piece of collaborative research between USDA and USAID has resulted in **economic gains of $389 million** per year, representing a **49% annual rate of return** on the research investment (See page 5).
- The development of **food-quality sorghums** which have improved the overall quality of the grain have generated a net benefit **of $180 million in savings to farmers and consumers, at an annual rate of return of 41.7%**, on the research investment.
- The **Low Energy, Precision Application irrigation technology**, called LEPA is designed to reduce water and energy use (See page 6). Developed in 1985 by the Texas Agricultural Experiment Station, it is a form of overhead irrigation that applies water much lower to the ground than conventional center-pivot systems, reducing water loss through evaporation and wind drift. LEPA systems reduce energy use by applying the water at low pressure. This method helps conserve the dwindling supply of water from the Ogallala Aquifer, benefiting all residents of the area. **The savings to the United States is $279.4 million annually, with an annual rate of return on research of 36%.**
- Current USDA research has shown that from northwestern Kansas to the Texas Panhandle, **crop rotation strategies can increase yields, dry matter accumulation, water and nutrient efficiencies, crop residue and economic returns, while protecting the land from both wind and water erosion** (See page 7-8).

U.S. sorghum occupies just 9.5% of the world area for this crop, yet produces 29.2% of the total world sorghum production. However, despite its importance as a major feed grain in the dominant feed grain country in the world, sorghum has taken a $500,000 budget cut in research funds over the past ten years. ARS's own review study shows that sorghum research expenditures have fallen below critical mass, while other commodities with considerably fewer acres and dollar values have received $1 million and $2 million increases in research funding. (See page 4)

I strongly encourage you to evaluate sorghum research expenditures and redistribute dollars back into sorghum research in accordance with the value, acres and importance of this crop in U.S. agriculture. In summary, our investment in agricultural research is decreasing and our research portfolio is becoming increasingly unbalanced at a time when the challenge to achieve global food security is growing in a race against time. We have been formulating policy to secure our future by looking in the rear-view mirror. It is time for a more balanced approach, increased investment and vision.

1986 USDA/CREES/ARS Research Dollars for Grain Crops

	(Million $)
1. Corn	25.56
2. Wheat	16.38
3. Soybeans	16.15
4. Sorghum	**3.02**
5. Rice	2.39
6. Barley	2.11
7. Oats	1.03

1990 USDA/CREES/ARS Research Dollars for Grain Crops

	(Million $)
1. Corn	31.66
2. Soybeans	24.60
3. Wheat	21.39
4. Rice	3.26
5. Barley	3.17
6. Sorghum	**2.90**
7. Oats	2.31

***1996 USDA/CREES/ARS Research Dollars for Grain Crops**

	(Million $)
1. Corn	34.54
2. Wheat	25.91
3. Soybeans	21.98
4. Rice	5.47
5. Barley	3.27
6. Oats	2.70
7. Sorghum	**2.51**

*Net research dollars

VALUE OF PRODUCTION (1,000 $)

	Corn	Soybeans	Wheat	Sorghum	Rice	Barley	Oats
1986	12,339,990	9,279,844	5,053,154	1,289,211	500,114	981,456	463,236
1987	14,107,705	11,391,000	5,497,712	1,179,444	971,167	967,008	605,599
1988	12,661,362	11,487,742	6,683,999	1,337,424	1,091,817	775,229	532,238
1989	17,912,895	10,916,145	7,542,464	1,287,739	1,134,039	968,108	548,938
1990	18,191,843	11,042,010	7,166,800	1,220,501	1,047,242	911,545	417,762
1991	17,860,347	11,091,996	5,954,912	1,338,560	1,213,330	996,542	309,735
1992	13,723,258	12,167,564	8,009,711	1,667,194	1,057,272	946,463	399,595
1993	16,031,861	11,949,633	7,644,737	1,234,500	1,245,757	812,899	291,014
1994	22,157,332	13,785,353	8,232,547	1,331,433	1,333,030	779,359	293,265
1995	22,632,7[illegible]	14,765,057	9,619,764	1,392,065	1,448,691	1,008,806	270,325
*1996	28,941,116	15,734,758	11,266,563	2,279,939	1,431,093	1,176,752	287,722

Source: USDA ERS/NASS
*Projected

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ECONOMIC BENEFITS FROM INTSORMIL GRAIN SORGHUM VARIETY IMPROVEMENTS IN THE UNITED STATES

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Texas Agricultural Experiment Station, Texas A&M University, College Station, TX

Report to University of Nebraska-Lincoln USAID/INTSORMIL under TAMRF No. 9045
March 15, 1991

SUMMARY

Significant variety/hybrid improvement programs at three of the INTSORMIL institutions focus on variety improvement for the U.S. as well as the developing world. The economic benefits from public investment in research to improve grain sorghum varieties under the INTSORMIL program were estimated with a multisector simulation model of the U.S. agricultural economy. The model estimates changes in domestic consumer and producer welfare and government program payments as well as foreign sector impacts.. Technology changes were measured as yield changes and chemical cost reductions per acre for biotype E greenbug resistant varieties developed from INTSORMIL research versus older nonresistant varieties.

U.S. producers of sorghum, oats and rice were primary beneficiaries of the resistant variety improvements ($273 million welfare gain) through the substitution of sorghum for wheat, corn and barley production in the Great Plains Region and the increased production of rice to replace reduced wheat output. U.S. consumers experienced welfare losses of $248 million through reduced domestic consumption and production use of wheat, corn and barley. However, lower participation rates for these commodities reduced the quantity going into government programs and rising market prices reduced the level of deficiency payments to farmers. Hence, a $364 million savings to taxpayers in government program costs was fostered by the variety improvements. The $116 million net gain to the consumer-taxpayer plus the $273 million increase in producer welfare result in a $389 million net welfare gain to the U.S. from the research under current farm program provisions.

Total funding for the INTSORMIL resistant variety research program (including non-federal matching and leveraged funds) for Kansas, Nebraska and Texas over the 1979-1989 period was $8.54 million. The annual rate of return on the research investment was 48.2%. Without farm commodity programs the net social benefit to the U.S. would be $113 million, yielding an annual rate of return on the research investment of 33.4%.

Other variety/hybrid improvement programs at the three INTSORMIL institutions focus on sorghum variety grain quality improvement for the U.S. as well as the developing world. Improved food quality sorghums are used as feed and for export. The food quality sorghums are superior to red sorghums for livestock and poultry feed and have potential as a food grain for export. The agricultural simulation model was also used to estimate changes in domestic consumer and producer welfare and government program payments as well as foreign sector impacts resulting from the food quality varieties developed under the INTSORMIL program. The analysis considered the use of food quality sorghums in the domestic hog feeding industry and for the export market to Mexico. Technology changes were measured by yield differentials and increased hog feeding efficiency (lb. feed/lb. gain) for varieties developed from the research versus the tropical and temperate-adapted red sorghum varieties under irrigation in the Texas High Plains and South Texas regions.

U.S. producers of sorghum, barley and oats and U.S. consumers are major beneficiaries of the technology, experiencing welfare gains of $141 million and $39 million, respectively. Reduced deficiency payments for corn, wheat and rice ($159 million) and decreased marketing loan payments for rice ($13 million) offset the increased deficiency payments for sorghum, barley and oats ($169 million) so that a $3 million reduction in government program costs occurs as a result of the technology advance. This reduction in government payments plus the $180 million gain in domestic producer and consumer welfare result in a $183 million net welfare gain to the U.S. from the research under current farm program provisions.

Total funding for the research from INTSORMIL and non-federal matching and leveraged funds over the 1979-1989 period was $7.18 million. The annual rate of return on the research investment to develop food quality grain sorghum was 41.7%. Without farm commodity programs the net social benefit to the U.S. would be $91 million and the annual rate of return on the investment would be 33.5%.

343

GRAIN SORGHUM RESPONSE TO SPRINKLER APPLICATION METHODS AND SYSTEM CAPACITY

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USDA Agricultural Research Service, Bushland, Texas

The crop yield response of grain sorghum to four sprinkler methods and four irrigation amounts which simulated varying irrigation capacities was evaluated during 1992 and 1993 at Bushland, Texas, in the Southern High Plains. Irrigation methods were LEPA sock, LEPA bubble, in-canopy spray near ground level, and overhead spray. The application devices were installed on a three-span, hose-fed, lateral-move sprinkler system. Irrigations were scheduled from neutron soil water measurements in a designated control treatment receiving 100% irrigation by the LEPA sock method. Soil water in the control plots was maintained above 75% of the plant available level by simultaneously applying 25-mm irrigations with all four sprinkler methods as the 1 00% irrigation amount. Deficit irrigation treatments received 75, 50, and 25% of the control treatment application on the same date. All furrows were diked to minimize runoff and enhance surface storage from irrigation and rainfall. The 100% irrigation treatments received 250 and 325 mm of irrigation in 1992 and 1993, respectively, along with 31 0 and 223 mm, respectively, of rainfall from emergence to the last irrigation. Grain sorghum yields were primarily affected by irrigation amount and to a lesser extent by sprinkler method, especially for the two smaller irrigation amounts. With deficit irrigation, the LEPA bubble and sock methods yielded better than the spray methods likely due to reducing evaporation from the crop canopy and soil and thus increasing the amount of water available for transpiration. For example with LEPA in 1992, grain sorghum yields were reduced only 1% while the irrigation amount was reduced from 250 mm for 100% irrigation to 125 mm for 50% irrigation.

A COMPARISON OF DRYLAND GRAIN PRODUCTION SYSTEMS FOR THE TEXAS HIGH PLAINS

Ordie Jones
USDA Agricultural Research Service, Bushland, Texas

Effects of no-tillage (NT) and stubble-mulch tillage (SM) management on water conservation, grain production and economics were compared for 10 years (1984-1993) at Bushland, Texas, for continuous wheat (CW), wheat-fallow (WF), wheat-sorghum-fallow (WSF) and continuous sorghum (CS) cropping systems. No-tillage management resulted in improved water conservation, which increased sorghum yields by five bushels per acre on the WSF system.

Wheat yields on WSF and WF cropping systems were not affected by tillage system, but the wheat yield on CW was increased three bushels per acre with NT. Sorghum yield on CS was reduced with NT, primarily because of thin stands. The average maximum yield response due to tillage management system did not exceed 10 percent for any cropping system.

Cropping system selection was much more important than tillage method, exerting a 400 percent effect on grain production when calculated on an annual basis. Annual production ranged from 11 bushels per acre with the WF system to 44 bushels per acre with CS.

Cropping systems with sorghum had much greater production than wheat systems because sorghum utilized the predominately summertime precipitation efficiently, producing more than twice as much grain per inch of precipitation than did wheat (Table 1). Rainfall during the 15-month fallow in the WF system averaged 29 inches and the soil can only store 10 inches, thus WF resulted in very inefficient use of water. Fallow efficiencies were much greater for the shorter 11-month fallow periods in the WSF system. Precipitation for the 10-year research period averaged 20.3 inches per year, nearly 2 inches above the 50-year average.

Economic analyses, using 1992 custom farming rates, commodity prices and farm program deficiency payments, showed returns to land, management and capital were much greater with CS and WSF systems (SM tillage) than with CW or WF systems, primarily due to increased yield of sorghum compared to wheat. Continuous wheat and WF systems were not economical for grain production in these analyses with either NT or SM tillage. Income from grazing would be required for CW and WF to be viable production systems.

Wheat-sorghum-fallow was the only cropping system that showed increased returns ($6/acre) due to NT. The research shows that with WSF cropping systems, herbicides can be used economically to manage residues, reduce evaporation and improve soil and water conservation on dryland. It also shows that stubble-mulch tillage is an excellent system for the Great Plains.

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COMPARISON OF FIVE SUMMER CROPS GROWN IN A WHEAT-SUMMER CROP-FALLOW ROTATION

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KSU Northwest Research-Extension Center, Colby, Kansas

The goal of this project is to determine the relative effects of several dryland summer crops on yield, dry matter accumulation, water and nutrient use, crop residue, and economic return. In this first year, we compared standard-height corn, dwarf corn, grain sorghum, millet, and sunflower in 15- and 30-inch row spacings. Plantings were delayed until June 13 and 14 because of wet conditions. The crop season was terminated much earlier than normal by a killing freeze on September 21. Excellent moisture conditions prevailed early, but the last half of the season was very dry. Given that weather conditions caused an abbreviated growing season, few conclusions are appropriate at this time.

The data suggest that sunflower has the potential to remove more water and plant nutrients than other dryland summer crops. Because of the late-season dry spell, all five crops depleted soil moisture to the same low level by the end of the season, but the depletion began earlier and at a higher rate with sunflowers. Higher concentrations and per-acre amounts of N, P, and K nutrients were found in sunflower dry matter than the other crops. Gross returns based only on yield were $245 for sunflowers ($0.106/lb.), $244 for standard and $235 for dwarf corn ($3.65/bu), $261 for grain sorghum and $166 for millet ($0.06/lb.). A more complete analysis is needed to fully evaluate net return. Sunflowers produced 4,520 lbs. crop residue/a, second only to millet with 4,835 lbs. Dwarf corn and millet produced substantially higher amounts of crop residue in 15-inch rows than 30-inch. Sunflowers and standard corn produced slightly higher amounts in 15-inch rows whereas grain sorghum produced more in 30-inch rows.

Summary:

- The over-supply of cereal grains and low commodity prices of the 1980s caused a tremendous cutback in research on production agriculture in our land-grant universities.
- Hiring of new faculty positions to replace retiring researchers is heavily influenced by the ability to obtain external funding for research and less by the agricultural problems that required solutions.
- The availability of research dollars has driven both the research agenda and the composition of faculty at universities with agricultural colleges.
- Global food output must double within the next 25 years to meet even the most conservative estimates of population growth and economic development.
- We must reassemble the talent at our universities and USDA extension facilities to address production constraints that will limit our ability to double global food production in the next 20 years while preserving soil and environmental quality.
- U.S. farmers will remain the most competitive in world markets in the next century only with a continuous stream of innovation and scientific discovery.
- The successful utilization of genetically engineered plants and protection of our natural resources will require much more sophisticated field-level management by farmers, and such information-intensive management will be difficult to achieve without greater research emphasis on problem-solving, field-based agronomy, plant physiology and soil science.
- The greatest economic and environmental benefits to our agricultural production systems have come from field-based, problem-solving research and conventional breeding efforts.
- **The rate of return on investment in agricultural research is typically above 40%.**
- Specific examples of how such research has advanced the sorghum industry include:
    - **Greenbug resistant** lines of sorghum germplasm.
        - Return on investment annually: **$389 million**
        - Rate of annual return on research investment: **49%**.
    - **Food-quality sorghums**
        - Return on investment annually: **$180 million**
        - Rate of annual return on research investment: **41.7%**.
    - **Low Energy, Precision Application irrigation technology**
        - Return on investment annually: **$279.4 million**
        - Rate of annual return on research investment: **36%.**
    - **Crop rotation strategies**
        - Increased yields
        - Protect soil from wind and water erosion
- Sorghum has taken a $500,000 budget cut in research funds over the past ten years, while other commodities with considerably fewer acres and dollar values have received $1 million and $2 million increases in research funding.
- Our investment in agricultural research is decreasing and our research portfolio is becoming increasingly unbalanced at a time when the challenge to achieve global food security is growing in a race against time.
- Sorghum reseach dollars should be increased and allocated in accordance with the value, acres and importance of this crop in U.S. agriculture

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TESTIMONY
of
MR. DEAN URMSTON
EXECUTIVE VICE PRESIDENT
AMERICAN SEED TRADE ASSOCIATION
before the
U.S. HOUSE OF REPRESENTATIVES
RESOURCE CONSERVATION, RESEARCH, AND FORESTRY SUBCOMMITTEE
COMMITTEE ON AGRICULTURE
July 17, 1996

Good morning Mr. Chairman and Members of the Subcommittee. I am Dean Urmston, executive vice president for the American Seed Trade Association. I want to thank you for this opportunity to testify before your Subcommittee on the role of the federal government in agricultural research, and the direction we at the American Seed Trade Association believe that it should take as we continue our job of helping American farmers feed our citizens and a growing world.

ASTA, as we are often called, is one of the oldest trade associations in the United States. Throughout our 113-year history, ASTA has had the responsibility and privilege of representing and serving the seed industry. Our motto -- "first - the seed" reflects our long-standing commitment to promoting, protecting, and advancing agricultural seed interests. Indeed, it is the seed -- the foundation of agriculture that enables American farmers to provide the food and fiber necessary to sustain life and a standard of living envied by many. As a point of interest, Mr. Chairman, the U.S. Department of Agriculture calculates current U.S. seed exports at $665 million annually. This can be contrasted to estimates for the U.S. market value at $5-6 billion and a world market estimated at around $60 billion. Obviously, seeds are the foundation of agriculture and account for a significant portion of agriculture's contribution to economies here and abroad.

To further demonstrate our commitment to support agriculture and our farmers, ASTA also manages two research entities -- the American Seed Research Foundation (ASRF) and the National Council of Commercial Plant Breeders (NCCPB). Both excel in basic research activities and are fully funded by select members of the ASTA. Their ongoing projects reflect our goal of solving tomorrow's problems today.

ASTA's 800 plus member companies know firsthand the importance of research. Our commitment to providing the best genetics to our farmers is the reason why we devote considerable resources, both financial and human, to sophisticated research programs. Since Henry Wallace first developed hybrid corn in the 1930's, private plant breeding has made significant contributions to varietal improvements. Our member companies are responsible for these important developments, and our commitment to serving the American farmer has never been stronger. To illustrate this point, private investments in breeding of both hybrid and non-hybrid crop varieties now extend to virtually all major field crops. Estimates show that annual research expenditures by our private seed companies increased dramatically, from about $28 million in 1960 to $470 million in 1994. By comparison, the public sector spent $1.1 billion on all crop research in 1994. Expanded intellectual property rights for biological inventions contributed to the growth in private sector plant breeding efforts during the past several years. For more information on the private sector's contributions, please refer to the graphs and charts included with my statement. They graphically detail today's plant breeding achievements.

While these expenditures are impressive, Mr. Chairman, we can't do it alone. To continue providing new and improved varieties, varieties that provide the qualities that our farmers have come to know and expect, ASTA believes that a renewed focus should be directed on research programs. All of us are well aware of tightening budgets and increased competition for dollars. ASTA would respectfully request that as programs are debated and discussed, emphasis be placed on the long-term effects and the benefits to the farmer as well as the taxpayer. Therefore, it is very important that a strategy be developed that takes into account the demands of the farmer for varieties that offer increased pest and disease resistance, and, of course, performance. As you know, for each farmer, regardless of their commodity or geographic location, their first planting decision involves the selection of seed. And, that seed selection is based on price, performance, and opportunity for profit.

Mr. Chairman, ASTA believes that there are three components that will lead to an effective and successful research effort. They include cooperation, vision, and partnerships. I'd like to take a moment to briefly offer our thoughts on each.

Cooperation

ASTA firmly believes that because of the strong cooperation between our industry and the U.S. Department of Agriculture, academic institutions, and land grant colleges, American food and fiber producers are better stewards, more productive, and more profitable than ever before. This dominance and success has also sustained a renewed ability to compete in international markets. Our farmers have truly benefitted from information sharing and joint ventures.

Vision

To sum up the vision of ASTA, I would point to the mounting accomplishments in the area of biotechnology. The products are numerous and the benefits reinforce the responsibility shared by our member companies to provide new products at a fair price with a promise to deliver the best science and technology has to offer. New varieties that promote good stewardship and strong performance are hallmark qualities that our customers have come to know and depend on.

Partnerships

ASTA has teamed up with the U.S. Department of Agriculture, academic institutions, land grant colleges and others to look ahead to future needs, demands, and challenges. Often times, our crystal ball has pointed us in a direction that provided the guidance we needed. Other times, however, like in the instance of karnal bunt, watermelon fruit blotch, and other infestations, the seed industry has sought to form alliances necessary to confront a problem. Success is dependent on sustained partnerships and thoughtful vision and cooperation.

It is clear that American consumers benefit from the advances made in agricultural research. One need only point to the percentage of income American consumers spend on food. Data from 1994 indicates that dollar amounts spent on food continues to decline, unlike the expenditures made by many of our foreign counterparts.

American farmers are known worldwide for their high production and skill Our food supply is safe, cheap, and abundant Yet, this has been accomplished with a federal commitment that has remained basically flat, and in some cases, regrettably, has decreased

ASTA is on record for balancing the budget Our members fully support and expect Congress to carefully review all programs, including research As taxpayers, they want a careful review and thoughtful deliberations They expect tough decisions They want a good return and high dividends on research expenditures

ASTA recognizes that the success of federally funded research is not measured by dollar amounts We want this Subcommittee and Congress to make the tough choices and establish priorities that take into account our goal of providing the best genetics farmers need

As you continue to deliberate on funding priorities for fiscal year 1997, ASTA would like to urge this Subcommittee to focus on three goals We would encourage you to look ahead with a vision, encourage and provide opportunities for cooperation, and support partnerships that ultimately benefit our citizens and our customers

Congress well knows that the decisions ahead are tough -- taxpayers must be comfortable that the dividends accrue and that the benefits are clear Duplicative projects, random slashing, and less than careful reviews of programs could be disastrous History has shown us in the seed industry that research investment dollars are well spent Though they remain quite high and product development is often times long in coming, they are nevertheless included in virtually every company's strategic plan

ASTA can assure this Subcommittee that we will continue to view our role as one of support to the American farmer We recognize the responsibility we have before us If, however, federal and university-based research is reduced, as in the case of Dr Reid Palmer at Iowa State in cytogenetics, there is no guarantee, Mr Chairman, that our industry can sustain the investments devoted to product development and basic research If we are faced with the choice to redirect our resources, and we turn to basic research, our customers could potentially face an interrupted supply of new and improved varieties

In short, Mr Chairman, we rely on the research work done by the federal government and other public institutions We believe in partnerships Industry can and will be a key player in the development and thought of new products as they go down the track to commercialization

On a related issue, we are gravely concerned that as Congress debates funding levels, that due consideration must be given to the increasing likelihood that even with adequate funding, more qualified people will be needed to fill the high technology position's this industry demands Numerous studies point to a decreasing number of vacancies in agricultural and natural science positions Plant breeding student numbers are down and unless programs are developed and students are recruited, it is likely that variety development will suffer

On a positive note, ASTA applauds Congress for establishing the National Research Education and Economics Advisory Board to provide advice and review on short- and long-term research projects and priorities Consolidating boards and panels is an excellent first step We do, however, urge you to fund the Board and begin awarding the research dollars to worthy applicants

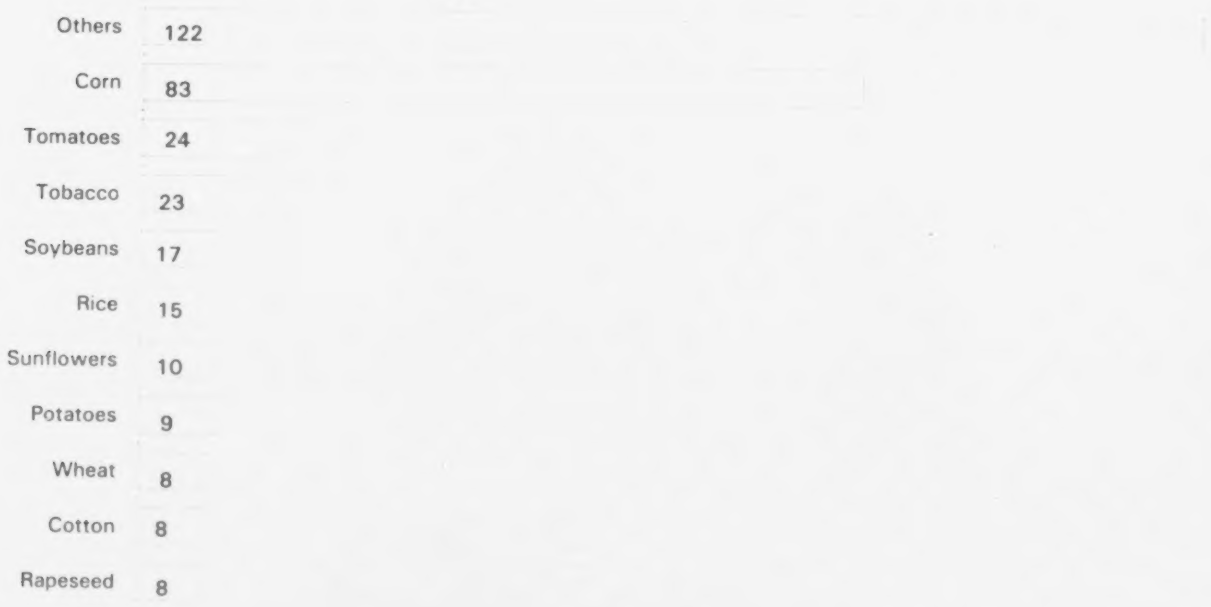
We further believe that a competitive grant process would enhance the overall effectiveness of publicly funded research programs We also think that by further concentrating federally funded research facilities into a more manageable number of focused and dedicated world class research, facilities would better utilize existing resources and priorities

Another area we believe the U S Department of Agriculture can provide support to our industry is to strengthen the National Genetics Resources Program As our overseas counterparts continue to develop laws and regulations affecting proprietary interests and germplasm access, the ability and tenacity of the USDA to negotiate such exchanges demands skill and vision As you know, the 1990 farm bill authorized the Secretary of Agriculture to provide available germplasm on request Unfortunately, however, the United States has been a little more generous with its germplasm, than other countries have We must always look ahead and evaluate our decisions and seek to position the United States in the most favorable manner

Finally, Mr Chairman, an issue related to agriculture research though not under your Subcommittee's purview, is the need for the extension of the research and development tax credit For ASTA members devoted to providing the genetics to America's farmers, a research and development tax credit is integral to the research and development decisions of our members As you know, such a credit would complement the time necessary to develop new products It is not uncommon for a span of seven to ten years to pass before any revenue is returned on an investment Our members make this investment year after year and such a tax credit would better enable us to offer our farmers the improved crop genetics they need and want to increase their yields and their income

In conclusion, Mr Chairman, we all know American agriculture is changing and it is doing so at a pace unprecedented The varieties of yesterday are obsolete New varieties must be developed, and there will be new challenges ahead for us There will be new disease infestations, changing farm practices, and other environmental concerns As an industry we must remain able to effectively do what we do best as an industry -- support the American farmer Our ability to react and adapt to change will demand an ongoing understanding and redefining of our resources While our mission will not change, our efforts will be constantly scrutinized and fine tuned

Thank you for this opportunity to visit with you and the members of the Subcommittee ASTA is pleased to be a part of these discussions and welcomes future dialogues on today's topic and those related to agricultrural research


286 Utility patents were issued between 1985 and 1994*

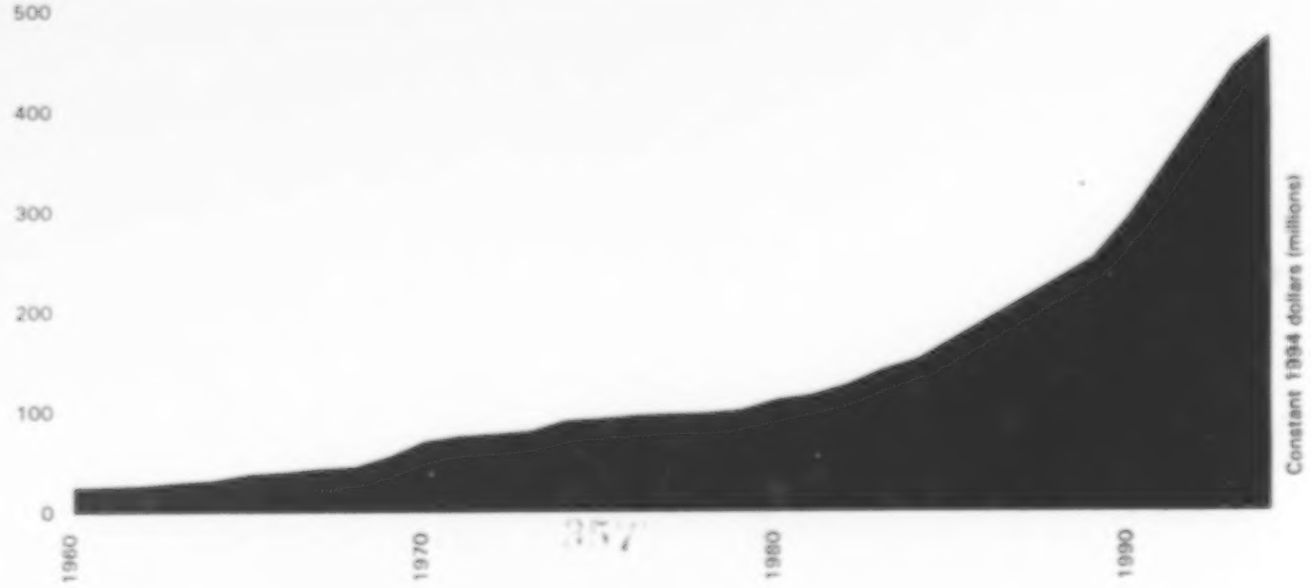
*Sum exceeds 286 because some patents cover more than one commodity

Intellectual property rights issued for new plant varieties show increasing trend

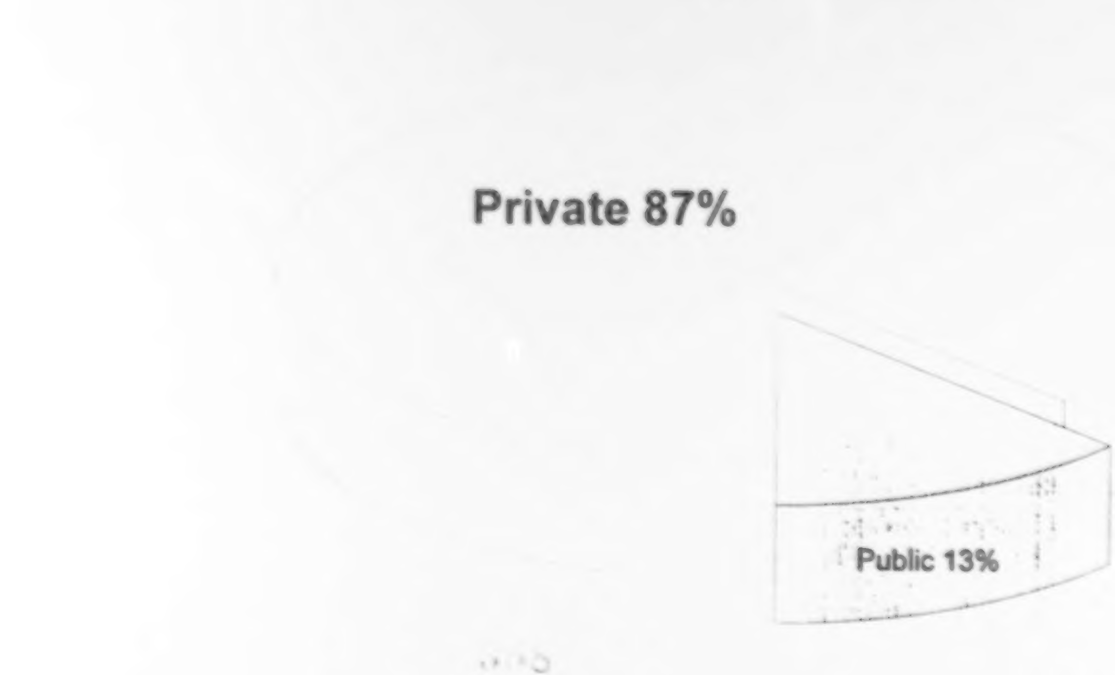
3,306 plant variety protection certificates were issued between 1970 and 1994

Flowers and ornamentals	139
Cotton	211
Wheat	314
Corn	322
Other field crops	356
Grasses and Forage	418
Soybeans	661
Vegetables	885

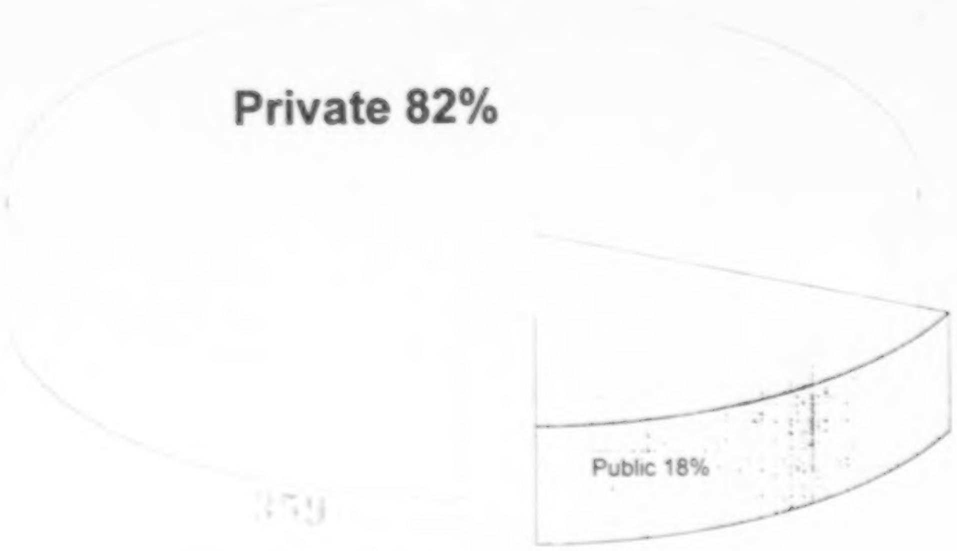
Private investment in plant breeding reached $470 million in 1994



Plant variety protection certificates



Utility patents for new plants or plant parts



SHARON ANDERSON, DIRECTOR
NORTH DAKOTA STATE UNIVERSITY EXTENSION SERVICE
TESTIMONY BEFORE THE HOUSE COMMITTEE ON AGRICULTURE SUBCOMMITTEE ON RESOURCE CONSERVATION, RESEARCH, AND FORESTRY
JULY 17, 1996

Mr. Chairman, Congressman Johnson, Members of the Subcommittee, I would like to thank you for the opportunity to provide testimony to this Subcommittee. I would also like to thank Representative Pomeroy for his dedication and hard work on behalf of Extension programs. My name is Sharon Anderson, and I am the Director of the North Dakota State University (NDSU) Extension Service. I would like to share with you today ways the Extension Service is making a difference in the lives of North Dakotans.

Mr. Chairman, I know that with the important work this Congress has to do to balance the federal budget, there is pressure to cut federal spending of nearly every kind. Extension is undoubtedly one of the many federal programs which is subject to significant scrutiny.

I would like to leave you with a simple message about Extension programs: the Extension Service plays a unique, much-needed role in today's increasingly competitive and ever-changing rural economy. It improves the lives of farmers, ranchers, students, educators and others in rural and urban America. It increases economic self-reliance and economic vitality in our communities. And it does all of this with a relatively modest investment.

NDSU Extension Service staff are located in 52 county offices, 8 area sites and on the NDSU campus in Fargo. The purpose of the organization is to create learning environments and partnerships for youth and adults that enhance their lives and their communities. Special emphasis is placed on programs in agriculture, youth development, human development and nutrition and community leadership.

In North Dakota, Extension staff are using state-of-the art technology to bring Extension programs to residents. In 1996, over 400 commercial pesticide applicators were trained via satellite downlink into 34 communities in the state. In 1995, 650 producers participated in a four-day wheat school taught at 48 sites simultaneously over the satellite system.

During Fiscal Year 1995, NDSU Extension Service agents and specialists had over 20 million contacts with North Dakotans, of which nearly 700,000 were face-to-face office visits, workshops, and farm/home/business visits. Extension's youth development programs involved about 51% of the potential youth audience in the state ages 8-18 with 7,900 adult volunteers helping facilitate the programs.

One way Extension improves the lives of farmers in North Dakota is through the timely dissemination of critical information. In 1995, North Dakota suffered a $27 million loss to wheat crops due to the Orange Wheat Blossom Midge (OWBM). This was the first year North Dakota ever suffered damage from the OWBM. Without the preliminary work of the Extension Service, damage would likely have been far greater.

The OWBM is a small, orange-colored fly, about half the size of a mosquito. It is difficult to detect, and can be spotted only at dusk. When present in large numbers, it can devastate a wheat crop. In 1995, the OWBM was found to be present in numbers large enough to cause significant economic damage. Extension agents warned growers of the danger through the mass media, extension agents' news columns, and via electronic mail. Extension agents conducted twilight meetings and crop tours attended by hundreds of farmers to check for the OWBM and to show farmers how to check their own crops. As a result, farmers were able to determine if their crops were at risk and whether it was economically feasible to apply insecticide.

In preparation for the 1996 growing season, Extension agents conducted soil surveys to check for larvae, published a map highlighting problem areas, and developed a computer model to predict the emergence of OWBM based on the weather and other factors. A statewide electronic information network, AGDAKOTA, was established to provide information and to allow ag professionals to share information quickly. Information gathered and disseminated by Extension agents likely saved farmers millions of dollars in potential crop loss.

Extension also promotes economic vitality, creates partnerships, and fosters learning opportunities in our communities. Through a partnership with Honda Motors, the Extension Service is building links between the public school system and private industry, and is helping create job opportunities for North Dakota's young people.

Honda, working with the Extension Service, is developing an apprenticeship program for high school students to work with local Honda dealers. Students will learn about high-tech careers available in the automotive industry and will receive significant workforce preparation. This expanded learning opportunity for North Dakota high school students is made possible through the unique ability of the Extension Service to bring together educators, students and private-sector leaders.

Mr. Chairman, Congressman Johnson, Members of the Subcommittee, these are just a few ways the Extension Service impacts the lives of North Dakotans. I ask you to keep in mind that the Extension Service plays a valuable role across America. It is a sound investment for our nation's future.

Thank you again for the opportunity to provide this testimony.

STATEMENT OF WALTER J. ARMBRUSTER

I am Walter J. Armbruster, chairman of the Board of Directors of C-FARE, the Council on Food, Agricultural and Resource Economics. C-FARE is an organization representing agricultural economists from throughout the U.S. who work in the public and private sectors.

This statement relates to agricultural extension programs administered by USDA. My comments focus on how information is shared and can be better managed and utilized, efficiency in providing educational programs through extension and how federal funds might be better leveraged to improve extension programming.

An increasing challenge facing land grant universities is to reconnect the research and extension agendas so that the tie between research findings and extension education are strengthened. It is critical to strengthen this relationship if extension programming is to continue to have a strong knowledge base to distinguish it from other educational efforts. This connection is appropriate for the agricultural sciences as well as other disciplinary knowledge. If this tie is to be strengthened, new incentives to better coordinate the priority setting among research, extension education and academic instruction components of the land grant institutions must be provided. Increasing concern about accountability for public funding implies that better coordination of priority setting and focus in those programs would be a positive step toward maintaining support.

Funding research and extension separately, with only some joint activity, does not provide a strong linkage between the two. More integration between extension and research to better coordinate efforts could be driven by increased linkage of funding for them. USDA's CREES, which combines the old Extension Service and Cooperative State Research Service at the national level, has been making strides in its leadership and coordination roles. However, it needs flexibility and resources to help achieve this goal. Congress, through its mandates, can play a significant catalytic role in integrating research and extension more closely.

While extension may need to look beyond traditional school of agriculture research bases, it must draw upon disciplinary research knowledge as the foundation for its educational programs. The source of research knowledge may be from within the colleges of agriculture, within the land grant universities, or even in other educational research institutions.

Turning to the question of efficiency in delivery of extension education programs, increasing attention in these times of budget pressures is being given to how to better share resources across state lines. Regional collaboration can provide efficiencies and some joint efforts are emerging. There are, however, political and institutional barriers at the state levels which impede progress in such sharing. Perhaps the federal role should be much more proactive in forging multi-state and regional linkages. This could come about through priority-setting exercises, targeted funding and program leadership at the federal level. Federal funding aimed at strengthening multi-state and regional collaborative efforts to reduce duplication might be significantly leveraged through state contributions to the extension programming involved. One possibility would be to provide regional funding for extension similar to what exists for research.

As Managing Director of Farm Foundation, my business is to leverage modest amounts of funds to obtain significant outcomes. I am often amazed at what can happen through a leveraging strategy. At the federal level, prioritizing public funds for partnered efforts with the private sector might provide significant leveraging. Certainly information dissemination through farm magazines and other media has become significant. Consultants operate in a wide range of arenas in which extension was formerly the primary source of knowledge dissemination. Many, if not most, consultants are associated with selling a product or service. There remains a strong role for extensions's unbiased advice and analysis. Nonetheless, extension needs to work closely with such intermediaries to deliver the educational product to the producer or consumer by leveraging the limited resources for the greatest outreach impact. However, sufficient attention must be paid to crediting extension as the underlying source of information, if support for public funding is to continue.

Dissemination of information incorporating economic and social science aspects or implications with production and technological information would better serve the needs of producers and consumers in many cases. Further efficiencies could be obtained by extension through better interdisciplinary information sharing. For example, the CRIS System could provide better links between the professions. The information dissemination processes from land grant institutions tend to inhibit such interdisciplinary sharing due to their focus on disciplinary boxes.

Implementing these suggestions may substantially improve the usefulness of extension information, increase the efficiency with which it is delivered, and leverage federal funds devoted to this important resource. I appreciate your willingness to consider them.

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